THE IRON AGE

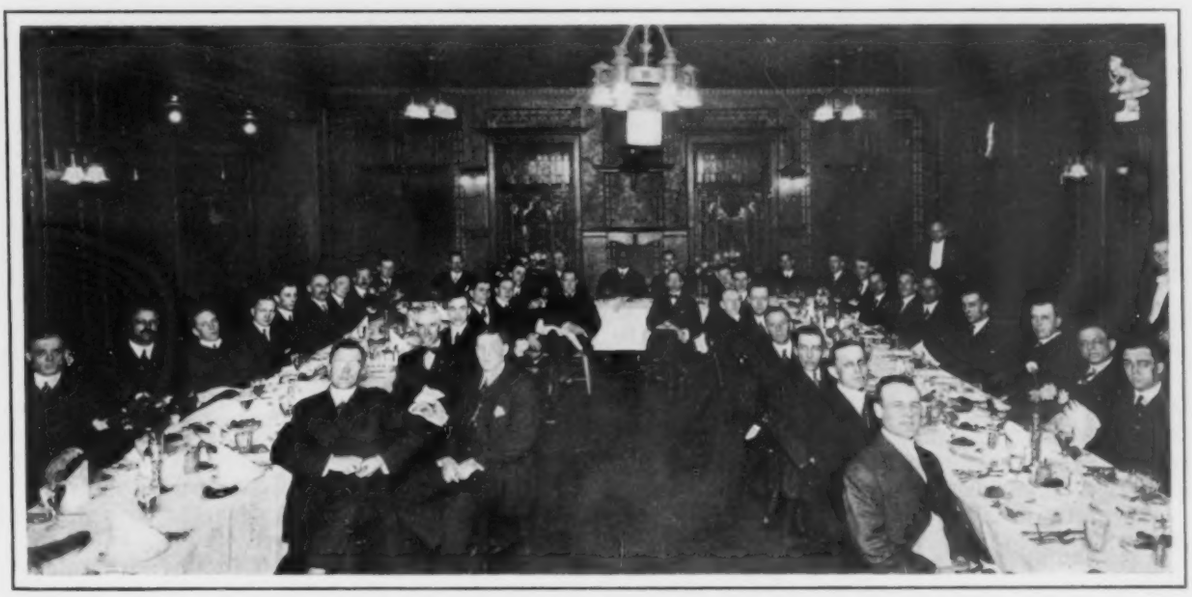
Established 1855 New York, July 2, 1914 *Vol. 94: No. 1*

A Departure in Industrial Management

Responsible Employees of Cleveland Hardware Company Form, with Officers, a Body of Working Stockholders Who Meet to Discuss Shop Problems

BY F. L. PRENTISS

Among the problems of the management of a large manufacturing plant is to keep in its organization men who have given long and valuable service and who may feel that they have reached a point where they can do better by branching out in some line of business of their own. Another of the problems is to improve the efficiency of other capable employees by having them take a more active interest in the success of the organization than they are inclined to do as mere employees. How to get away from the type of organization in which only a very few of the executive heads have a financial interest in the business and authority in the management, all others being only salaried employees is a subject that has been given much attention by the Cleveland Hardware Company, Cleveland, Ohio. It has developed a plan of new industrial management which has been in operation long enough to be thoroughly tested and which is proving highly satisfactory to the company.



Employee-Stockholder-Managers of the Cleveland Hardware Company, Who Discuss Shop and Other Business Problems of the Company at Monthly Dinners

A few years ago this company was a close corporation with only about half a dozen stockholders. The first step in extending the ownership and management beyond a very limited few was taken several years ago when some of the department managers and traveling salesmen were given permission to purchase stock in the company. Rapid growth resulting in the building of a second plant and enlarging the original plant necessitated an increase in the capital stock about three years ago and at that time $150,000 in common stock was set aside to be sold to various department heads, foremen and others holding responsible positions, men who had been in the company long enough to develop and prove their worth so that the company was anxious to keep them.

Various industrial companies have adopted stock distribution plans, but have carried them no further than to allow employees promiscuously to subscribe for stock so that they would feel a stronger personal interest in the organization by reason of a small stock ownership. However, the plan adopted by this company was entirely different from the ordinary one of merely selling stock to its employees. In fact it saw no material advantage in simply disposing of stock in this way, but it adopted a broader policy of making partners of those employees, who are favored with an opportunity to buy stock. No claim is made that the plan as carried out was adopted with any philanthropic motive any more than is the claim advanced by most plant managers that welfare work is done

with philanthropic motives. The underlying motive is the efficiency and success of the organization.

The stock distribution plan consists of picking out those employees in whom the company wishes to show its confidence and of allowing them to purchase stock and have an active hand in the business management. To these men the stock is offered at par, regardless of its real value, in lots of 5, 10 or 15 shares, and the men are allowed to pay for the stock as it suits their convenience. The stock is held in trust by one of the Cleveland banks, and as soon as one share is paid for, a certificate for that share is issued by the bank by direction of the company. Payments on the stock subscription are made direct to the company. Employees receive the usual monthly dividend at the rate of 6 per cent. per annum on all stock subscriptions whether completely paid for or not and pay to the company 6 per cent. interest on unpaid portions of their stock subscriptions. The fact that the company has always been able to pay its regular dividends out of earnings and has accumulated a large surplus indicates that no period of depression would seriously endanger the regular dividend payments.

Every employee who has been given an opportunity to subscribe for the stock has done so, and many have subscribed for additional shares as soon as their original stock subscription was paid up. Should any employee leave the company he retains the stock he has bought, but he is not allowed to complete the purchase of stock partly paid for, the amount he has paid on the latter being returned to him by the company. In case a stock dividend is declared stock subscribed for, but not paid for, receives its proportion of such issue of dividend stock, which is issued to him as soon as the original stock is paid for. Up to the present time, 30 employees have become stockholders and these with the officers and other executive heads form a body of 39 working partners or stockholders. This body of working partners, in addition to the executive heads, comprises all the department managers, all the traveling salesmen, the purchasing agent, the master mechanic, the machine shop foremen, forge shop superintendents, roller in the rolling mill and shipping clerk.

The most interesting feature of the plan is the method employed to bring about what may be termed the joint management by the working stockholders. Once a month these stockholders meet for dinner at a downtown hotel, and after dinner about two hours of the evening are devoted to a discussion of various matters pertaining to every department of the company's business. As these meetings are for working stockholders, outside stockholders who are not actively interested in the conduct of the business do not participate. The dinner is provided at the company's expense, and the place of meeting is changed around from month to month among the best hotels and restaurants. Although the dinner could be provided in the dining room connected with the company's offices, it is regarded as more desirable to take the men away from the environments of the factory. It is needless to say that many of the working stockholders look forward with pleasure to a dinner and meeting in a hotel dining room, which many of them seldom, if ever, patronize individually. The dinners are always held Saturday evening so that the men have plenty of time after leaving work at noon to dress for the occasion.

The business sessions of the working stockholders following the dinner are usually presided over by C. E. Adams, the president and general manager, who opens the meetings with a talk about various topics in connection with the operation of the plant. Talks are also often given by other executive officers. An interesting feature of these talks is that the men are taken into full confidence with the management. Figures showing the cost of manufacture and various items of operating expense are given fully and explained. If, for example, a foreman knows by actual figures the amount of gas the furnaces consumed in the previous month, or the lighting bill, or the loss that will be caused should a piece of steel be spoiled under a drop hammer, the impression that has been created by the presentation of the actual monthly bills will make him more diligent in his efforts to prevent waste and loss. At the same time he will be sure to keep in mind that even though only in a small way, he is one of the owners of the plant and as such interested in preventing avoidable losses.

Three or four meetings were held before the men realized that the company was in earnest in its efforts to make all the working stockholders actual partners in the business and that advice in the plant management was really wanted or would be followed. At first, too, there was more or less constraint among the men who lacked experience in expressing their thoughts and particularly before an audience of two score men. However, this feeling has to a large extent disappeared and the men freely participate in the discussion and offer good practical suggestions that are carried out. They were quick to learn that their advice was really sought, when they found that suggestions made Saturday night were often put into effect Monday morning. Whenever the suggestion recommended at a meeting of the employee stockholders is regarded as impracticable by the management, the officers feel that it is their duty to present convincing arguments to show why proposed plan or change should not be put into effect.

The general plan followed at the conference of working stockholders is to turn the meeting over to one of the various departments after a preliminary talk by the president. Some one presents a paper on a subject pertaining to his department which has been previously assigned to him and a general discussion follows, in which a lively interest is nearly always taken. Not only have the foremen, superintendents and other employee stockholders outside of the executive officers cultivated their latent talents at the meetings so that they are able to present facts and arguments forcibly, but their viewpoint has been broadened and they have developed into business men of good judgment. The operation of the system means an advanced form of team work in which the president, department managers, superintendents, foremen and others meet on common ground as employed or working stockholders, all working together for the good of the organization.

Pressed Steel Substitutes for Forgings and Castings

A number of interesting uses of pressed steel parts as substitutes for forgings and castings have been worked out by the Oakes Pressed Steel Company, Indianapolis, Ind. It is stated that the business of this company has been developed almost entirely from new uses to which pressed steel could be adapted. One of the instances where a casting has been supplanted by a pressed steel part is the driving pulley for the fan of an automobile engine. When this part was cast it cost approximately 16 c., including the machine work necessary to finish it, while in pressed steel the cost has been reduced as low as 8c. and no machining is required. In this way a finished pulley has been produced ready to assemble which is claimed to be stronger and to weigh only half as much.

To Make Molding Machines Most Effective

Suggestions Growing Out of Experience—Proneness to Regard a Mechanism as All Sufficient without Requiring Exercise of Molder's Judgment

BY H. W. LENGFELDER*

It has been said that the amount of defective castings, when molds are made on a molding machine, is greater than when made by hand. This is probably true in many cases, but there is no valid reason why this condition should prevail. The molding machine can and ought to produce molds where the loss is less than in hand work. Where it does not, the failure is due to ignorance. We must continually bear in mind that the machine is only a mechanism; it has no brains. The intelligence necessary to produce good molds must be furnished by the operator. It is this lack of applied knowledge of good sound molding principles that causes so much complaint. Any man can not make molds on a machine. It is true that any one can make the mold, but the production of molds which will give a high clean percentage of clean, sound castings requires an intelligent preparation of materials and utensils.

COPES TOO SHALLOW

There are several factors that lead to bad castings made, for example, on a squeeze machine. The use of copes, which are too shallow, lead as much as anything to trouble. The prevailing idea, to economize and get large production, is to cut the amount of sand, and the cope comes in for its share of paring. This is no economy at all. For many reasons it is far better to increase the depth of the cope. The squeeze then does not become too hard, shrinkage is reduced and blow holes largely eliminated. It is especially so where tubing is used to cut the inlet for the metal. In using the tubing the rammed sand is made still harder, often too hard, and causes the metal to boil while entering the mold, a condition that is not conducive to perfect castings.

When the pattern is irregular and has high and low portions, good results are obtained by a little judicious hand work and special bottom boards for the drag that conform to the contour of the pattern; but in the cope, where an even surface is required for the snap weight, another course is necessary to reduce the pressure over the high points.

GOOD PRACTICE WITH IRREGULAR PATTERNS

A good plan is to use a frame on the cope part of the flask about ¼ in. or ½ in. deeper than the depth of the squeeze. In the pressure board openings can be cut over the high parts to relieve the pressure. All this requires a little extra work, seemingly unnecessary operations if you please, such as taking off the frame and striking down the surplus sand level with the cope, but these are the very things that will produce good castings, the object, after all, that foundrymen are striving for.

When half patterns are mounted on each side of a board more or less trouble is found with shift. Usually the pattern shop comes in for condemnation, but in many cases the trouble is with the flask or slip boxes. It is absolutely essential that the flask pins be rigid and perpendicular to the face of the board. As the pins deflect from the perpendicular and as the thickness of the board increases, the amount of shift in the casting increases. For this reason it is better to have patterns mounted on thin plates, or better still, to have a separate board or plate for cope and drag.

Where slip boxes are used, tapered flasks and boxes excepted, provision should be made so that in slipping the jacket over the mold, the cope cannot be shifted. The cope and drag being rammed from a smooth surface can easily be shifted. For this reason we have a bead of sand around the pattern which also serves the purpose of reducing the runouts. Probably better than slip boxes are cast iron bands, made to fit easily into the snap-flask. In using bands some provision must be made to hold them in place. Where they fit loosely, they will cause shift also, because in setting the cope to one side on edge the band loses its position with regard to the pins and in closing shows a shift. The safest and best plan, no doubt, is the tapered snap flask and iron slip boxes.

LENIENCY IN MOLDING MACHINE WORK

In the endeavor to get a large daily output, men are permitted to slight and eliminate operations, which are always insisted on, however, in hand molding. For instance, the workman is not required to vent the mold regardless of the shape of the pattern. Of course there are many classes of work where venting is not necessary, but instances can be cited where loss of castings was excessive on this account.

Where runner blocks are used for pouring, judgment must be used in placing them properly, and avoiding too great a squeeze under the block. Small blank gear wheels, hand wheels, etc., which must be gated from the hub, will cause no end of trouble, if the necessary precaution is not taken to insure that the sand is not squeezed too hard over the hub. The machine shop will find the defects, even if they are not seen in the foundry. The construction of the pattern, the proper mounting and gating, are the problems which must be solved by the foreman. Much less can be done to minimize defectives, if care and good judgment are used.

Frequent examples of so-called economy that have proved costly can be seen in many foundries. In one case, in order to use a certain size flask the patterns were placed so close together that in pouring, the gate between them broke down, and of course a large loss resulted. In other instances too many large chunks have been placed in a mold to reduce the cost per piece. The result was a loss of 15 per cent. in one bad casting, which more than offset the attempted saving.

Better quality and a greater quantity of castings without additional labor is the object in view. The prime factor should be good castings. Where the piece work system prevails, some foundrymen think that their loss on defective castings is only the labor and fuel necessary to remelt. If this were true, little need be said along this line. It is safe to say, however, that in foundries where cost reports are kept, this loss is shown to range from $20 per ton upward. Therefore efforts directed to cut down bad castings will usually prove profitable, and the future successful foundryman will have to pay close attention to this aspect of the business.

*The author gave other aspects of the usefulness of the molding machine in *The Iron Age* of January 23, 1913.

The Manufacture of Crucible Steel*

The Equipment and Procedure as Typified in the Plant of the Braeburn Steel Company — Growth of the Industry

—BY GEORGE H. NEILSON†

The pioneers in crucible melting are said to have been the Chinese, who used the process many centuries ago. But the art in China never progressed beyond the initial stage. The real father of the crucible steel industry was Daniel Huntsman, of Sheffield, England, a clock maker, who found it impossible to get uniform steel from which to make his springs and he hit on the idea of fusing blister steel in a crucible. This was in the latter part of the eighteenth century and the melting of crucible steel has changed but little since that time. The details have changed somewhat but the actual process is much the same.

The material to be melted is loaded in a crucible, covered with a cap to keep out the gases, and placed in a hot hole and left there until melted. The crucibles have changed, the holes also have been changed in shape and size, and the method of heating is not the same but the process is practically unchanged. Clay crucibles were the first of which we have any definite knowledge. They held about 50 or 75 lb. and lasted but one heat and very often cracked and went to pieces before the steel was melted. Clay crucibles of the present day are much more durable and are extensively used in Europe, but little in this country. They have one decided advantage over the plumbago, or graphite, crucibles inasmuch as they do not throw off any carbon during the melting process.

The plumbago crucible, which is the most generally used in this country, consists of about equal parts of plumbago and clay. The greater part of the plumbago is imported from Ceylon. These crucibles are capable of withstanding a very severe temperature and can be used a number of times, depending greatly on the nature of the mix and also whether the crucibles are replaced in the furnace before they get cold. The usual practice is to get as many heats as possible from the crucible without letting it cool. As soon as the melted steel is poured out it is re-charged by hand, or by means of a mechanical shaker, and the crucible returned to the melting hole.

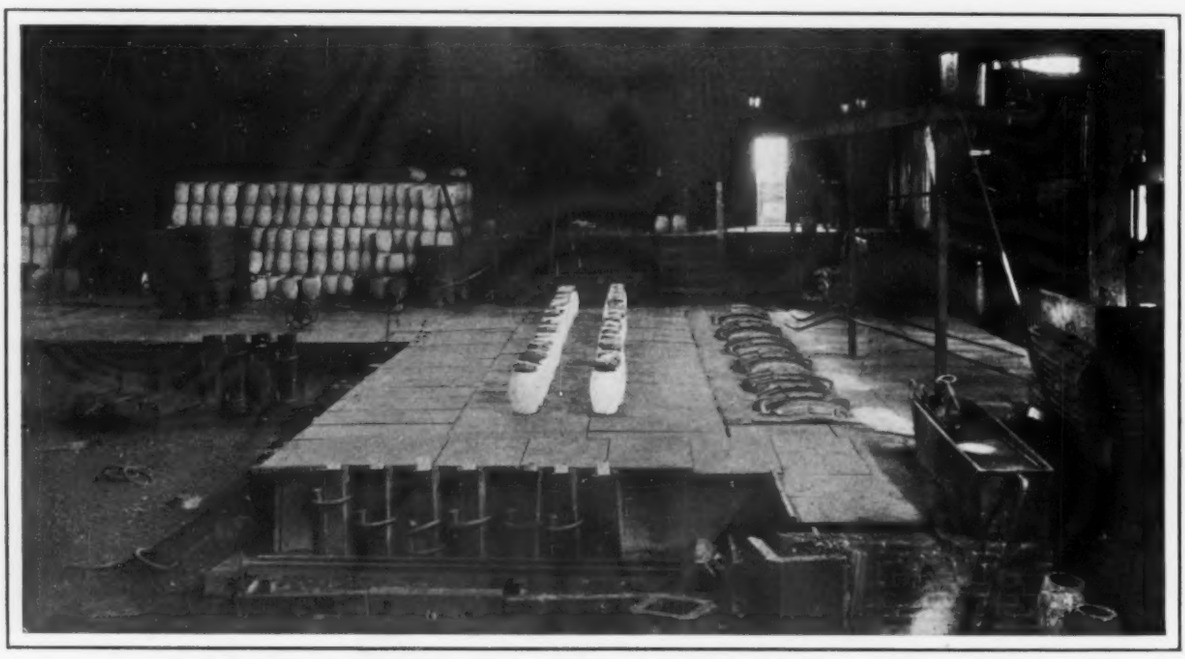
THE FURNACE

The modern crucible furnace is of the regenerative type and is heated by gas, generally producer gas, although where natural gas can be obtained it is often used. Natural gas is probably a more costly way to run a furnace but it has many advantages over producer gas. It is easier to regulate, as the flow is constant, which is not the case with producer gas unless a large holder is used. It is free from the poisonous fumes of the producer gas and is much cleaner. I am not in a position to say whether or not it is harder on the crucibles and furnace than producer gas.

The capacity of a furnace is spoken of in pots, that is, the number of crucibles the furnace will accommodate at one time. The furnace holes, in which the crucibles are placed, hold 6 crucibles so a 36-pot furnace is one of 6 holes. The gas enters the holes at the bottom on one side, mixing with the air immediately before entering the melting hole, and passes out at the opposite side and then through checker work to the stack. When the valve is reversed the direction of the flow of the gas is reversed. This is done every 15 or 20 minutes and in this way the checker work on both sides is kept hot. The gas should not be pulled through the

*From an address, on retiring as chairman of the mechanical section of the Engineers' Society of Western Pennsylvania, February 3.

†Secretary and general manager, Braeburn Steel Company, Braeburn, Pa.



A 36-Pot Furnace in the Works of the Braeburn Steel Company, Showing Also the Ingot Molds

melting hole too rapidly. If it is, it will cut the port holes and also cut the crucibles. The gas should fill the melting hole and show a small flame around the covers. This is a sure indication that the gas is getting around the crucible and not pulling across the bottom. The detail of the hole is here given, and a modern 36-pot furnace is shown in the accompanying reproduction of a photograph.

CHARGE OR MIX

The basis of good crucible steel is iron and consequently the better the iron the better will be the steel. Therefore, it is vitally necessary that iron low in phosphorus and sulphur be used. As the crucibles generally in use hold 100 to 125 lb., the mix or charge is weighed up in lots of that weight and placed in pans, called weigh pans, from which it is transferred to the crucibles. In order to get the exact analysis the weighing must be carefully done, in many cases to the exact ounce. When the crucible is filled it is covered with a cap. This is done to exclude deleterious gases which otherwise would impregnate the steel. When the material to be melted is weighed up the amount of carbon given off by the crucible must be taken into consideration. If this is not done the carbon content of the ingots will run higher than expected. The new pots, as a rule, do not throw off as much carbon as they will the second time used and after the third heat the amount thrown out will be immaterial.

The length of time necessary to reduce the mix to a molten state varies, depending on the makeup of the mix itself, and will take anywhere from two to five hours. When the steel becomes fluid it is usually good practice to "kill it," or in other words drive out the gases which would otherwise result in blow holes in the ingot. This process of "killing" usually takes from 20 minutes to one hour or longer.

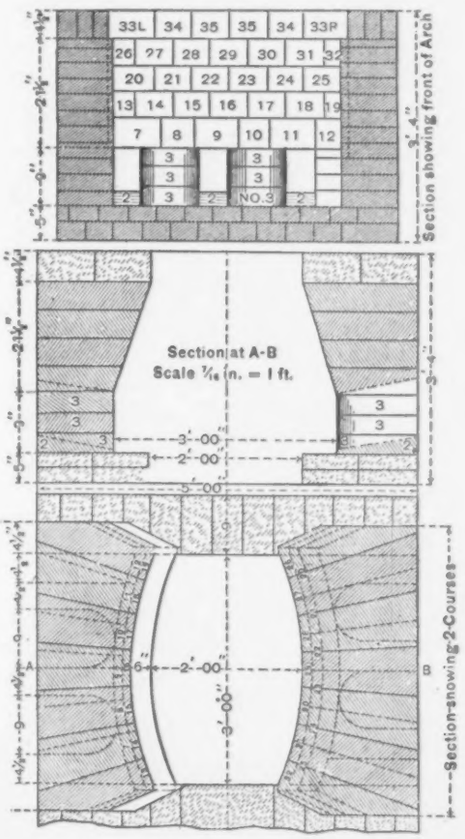
MOLDS

The molds in general used are known as split angle molds. They are made in two pieces, held together by rings and wedges, one ring at the top and one at the bottom. The three essential qualities are long life, smooth finish and tight joints. If the inside finish is not smooth the ingot will have a rough surface which may result in defects in the finished bar. If the joints are not tight the hot metal will work through and form a fin on the ingot. This fin will have to be removed, which means added cost. If it is not removed it will work into the steel and cause complications. The smaller molds have the bottoms cast with the sides. The larger molds, 7-in. and over, have no bottoms as a rule, the molds being set up on removable bottoms. Before the molds are used the general practice is to smoke them with rosin, or some other heavy, greasy, smoke making material. This prevents the ingots from sticking and also makes a smoother surface. The molds should also be warmed before using.

TEEMING OR POURING

Teeming is a very important feature and is not merely dumping the hot steel from the crucible into the mold in a haphazard way. In the first place the stream must be steady; if it is stopped and then started again there will be a weak spot in the ingot. The chilling of the metal first poured, however slight, will result in a non-homogeneous mass and the ingot when hammered will break at the point where the stopping of the stream occurred. The stream should never be allowed to strike the sides of the mold, if it does it will cut the mold and the result will be rough ingots and in a heat or two put the mold out of commission; also the stream should be started as gently as possible. If it is teemed in without care the metal will splash against the sides of the mold and cause the lower part of the ingot to be rough.

This teeming is not as easy as it looks and it takes considerable practice to make a man an expert. The weight lifted is quite considerable, the crucible and the tongs weigh about 60 lb. and the steel about 100 lb., a total of 160 lb. This weight has to be lifted and held steady so that the steel will flow from the crucible evenly and at a uniform rate. Some of our strongest furnace men never learned to teem properly. They had the strength but could



Details of Hole in a Crucible Furnace

not master the art. When a ladle is used, of course, the difficulty of teeming is done away with, as the steel can be dumped into the ladle as fast as possible and the teeming is then done from the ladle itself. Both methods have their advantages. It is necessary that the molds be set up straight, or in other words plumb; if they are not the melter is more than likely to teem against the side and a mold out of plumb is likely to have a bad effect on the steel as it chills. Before the steel is poured out of the crucible the dirt, which has risen to the top, should be removed. This is easily and quickly done by means of a steel rod known as a flux stick; the flux will adhere to it and can be removed without trouble.

PIPING IN THE INGOT

The worst enemy of the crucible steel melter is piping. Piping is caused by the sides of the ingot cooling faster than the center. The molten steel which comes in contact with the sides of the mold cools much faster than the center of the ingot. This cooling effect of the mold is felt for as great a distance, approximately, as the mold is thick. In other words a mold 2½ in. thick will have a chilling effect on the hot steel for that depth and the result is

that the steel thus affected will separate from the rest and the pipe will form. Of course, this result is greatest at the top of the ingot for the reason that the tendency of the pipe to form lower down is off-set by the metal from the upper part of the ingot filling in the space. There is no cure for pipe after it gets into an ingot as it cannot be welded out or worked out and will result in the splitting of the steel when hardened.

The most general mode of treating pipe is to use hot tops. A hot top is a brick made of fire clay with a hole through it, the size of brick and hole depending on the size of the ingot cast. The method handling hot tops is as follows: When the mold has been almost filled the hot top is placed on top of the hot steel in the mold and the hole filled with the melted steel. This plug, as we may call it, settles into the pipe as it develops and also has a tendency to keep the top of the ingot hot and thus lessen the pipe. The hot top, however, does not prevent the formation of small cavities below the main portion of the pipe. It should be remembered that the hot top brick must be heated to as high a temperature as it will stand before being placed in the ingot. If this is not done the cold brick will chill the steel and destroy the usefulness of the hot top.

A number of patent molds have been tried but all have been of indifferent success and the added cost has worked against them. There is no doubt that the present style of mold aids piping and all of us who are makers of high carbon steel are living in hopes that some day someone will discover a mold that will eliminate it, at least to a great extent. Some of the present molds, those for instance which are tapered with the large end up or those that have hot material packed around the top, are merely adaptations of the hot top idea.

When the ingots are cold they are removed from the mold and topped, that is, the top is broken off so that a clean fracture is obtained. This is not a laborious job and two trained toppers can top a large number of ingots during a day's work. A trained eye can tell from the fracture the carbon content of the ingot within 0.05 per cent. This is not as difficult as it may seem and anyone with practice can become very efficient. The manganese, phosphorus, sulphur and silicon cannot be determined this way. Neither can the carbon of high speed steel be determined from the fracture.

WORKING

The process of working the steel after it is made is of great importance and the old rule of thumb days are over. The heating of steel was guessed at and many a good piece of steel was ruined by a worker who inherited his trained eye from his grandfather. Luckily for the steel maker the use of pyrometers is becoming more general every day and guessing at hardening temperatures is rarely done. No steel can be made fool proof and no overheated steel can be made as good as it was before it was overheated. It can, if not too far gone, be restored partially but that is all. High speed steel is as near fool proof as any but even it can be harmed by too much fire.

Rolling, like hammering, must be carefully done if good results are to be expected. The heating should be exact, not guessed at. If the heating is not made to conform to the carbon content of the steel the results will not be satisfactory. Rolling crucible steel is not a tonnage proposition; it cannot be rushed out if good results are expected. To illustrate: In reducing a 3-in. square billet of open hearth to ½-in. round we would have, say, 14 passes through a mill driven at high speed and at the finish a bar approximately 100 ft. in length. With crucible steel, to obtain a ½-in. round, we would have 21 passes through a mill driven much slower and a bar about 12 to 14 ft. long, but the extra and slower work means a finished bar much closer to size, planished and free from scale.

HAMMERING

Hammers are of two kinds, single leg and double leg. The single leg hammer has one advantage, the absence of one leg allows the hammerman to work both across and lengthwise on his die, which is at times an advantage. This hammer, however, is more difficult to keep steady than the two leg hammer as it has a tendency to spring with the blow of the ram and thus work loose on its foundation. The different size hammers and the size of the work usually done on them is as follows: A 500-lb. hammer is capable of handling bars ¼ in. up to and including ¾ in. A 1000-lb. hammer handles bars from ¾ in. to 1⅝ in. A 2000-lb. hammer can work bars 1⅝ in. to 3 in. and a 3-ton hammer bars from 3 to 6 in. Of course, smaller or larger sizes than those enumerated can be worked on the various hammers, but the general practice is within the limits given.

The 500-ton steam hydraulic press will work high carbon ingots 16 in. square. The press has some advantages over a hammer. It is much easier on the workmen as it is free from shock and jar and for this same reason it does not cause deterioration of furnaces and foundations adjacent to it. It works the steel all the way through and gives it a density which a hammer does not. This is probably due to the fact that pressing the steel causes it to flow while the blow of the hammer is merely local and is not sustained long enough to affect the steel to the center.

Hammered steel, that is, steel worked into shape under a hammer, must be very carefully handled if the best results are to be obtained. The bar to be hammered must not be overheated; if it is the coarse grain resulting will not respond to the refining influence of the hammer, but it must be soaked or in other words heated through. The hammering must be done intelligently and the blows of the hammer regulated to correspond to the diminishing temperature of the bar. It is also important that the work done should not be done under a hammer too heavy or too light for the work. A heavy hammer will rupture the steel and a hammer too light will necessitate too many blows and continued reheating.

The weight of a hammer is, in shop parlance, governed by the weight of the ram, piston rod and piston head. For example, if the hammer is a 6-ton hammer then the rod, ram and head weigh 6 tons.

That the forming of combinations has not caused a decrease in the number of plants engaged in the manufacture of crucible steel is clearly shown in the following table:

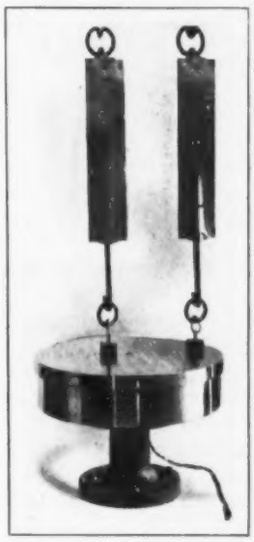
Year	No. of Companies	Gross Tons
1889	43	111,500
1892	45	105,000
1894	48	99,000
1896	45	98,700
1898	45	177,000
1901	45	175,000
1904	57	226,610
1908	79	295,385

In 1901, the period of combinations, it shows that there were 45 companies engaged in the manufacture of crucible steel, while in 1908, there were 79 companies in the business. These figures were taken from the reports of the American Iron and Steel Association.

NEW HEALD MAGNETIC CHUCK

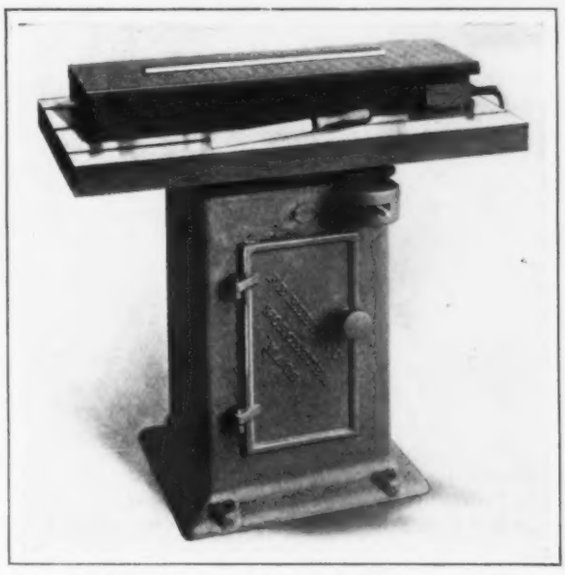
A Line of Flat and Rotary Types with Various Original Features

The Heald Machine Company, Worcester, Mass., has brought out a line of magnetic chucks in which are embodied what are believed to be a number of original features. In the first place the holding power is great, as will be seen in one of the accompanying illustrations, where a 16-in. rotary chuck is shown holding two 1-in. cube test blocks, each of which is sustaining a pull of 112 lb. As one block is at the center and the other close to the outer circumference of the magnetic face, the even apportionment of the magnetic power over the entire face is demonstrated, as the two scales give the same reading. The electric power required is small. Owing to the small amount of dead surface on the face of the chuck the range of work which may be held is great, down to very small dimensions. The non-heating qualities are important, and, moreover, the chuck is waterproof. Therefore, no ventilation is required. An interesting and unusual element in the design is the ease with which the chuck can be changed for different voltages. No change in the winding of the coils is required, a simple rearrangement of the lead wires connecting the poles being all that is necessary. The chuck is of steel throughout, a special soft steel having great permeability being used.

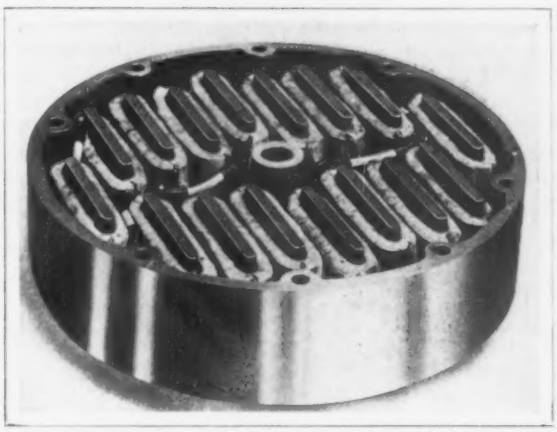


The Chuck Sustaining a Pull of 112 Lb. Both at the Center and the Outer Circumference of Its Magnetic Surface

The chuck consists of a body or shell—integral with which are cast the poles and the top plate. The poles are ground flush with the edge of the body, so that the top plate is in perfect contact with them. Each pole has its individual coil. Each pair of poles forms a complete horseshoe magnet, the

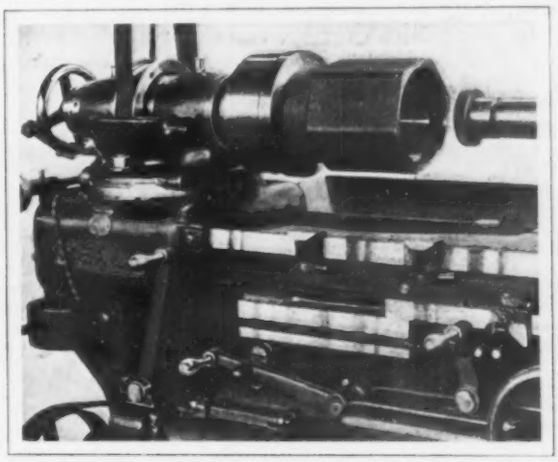


A Flat Chuck Used in Conjunction with a Scraper Table



The Interior of the Chuck Showing the Arrangement of the Coils

work lying directly across the ends like an armature. The 16 poles of the 12-in. chuck are connected up for 110 volts in two groups of eight. If it were desired to change the chuck for 220 volts it would only be necessary to connect the poles into a single group of 16. The advantage of this arrangement of coils is that the magnetic current has only a short path to travel, which means not only that the holding power is exceptionally great and is distributed evenly over the magnetic face, but also that the amount of electric power consumed is small, which, in conjunction with correctly wound coils minimizes the degree of heat generated. The



A Rotary Magnetic Chuck Holding a 15-Lb. Casting for a Grinding Operation

coils are specially treated to render them waterproof and to sustain any heat which might result from some unusual circumstance, up to 550 deg. F. As the lines of force are confined to the short direct paths between the poles, the magnetic current does not reach the body or outer wall of the chuck, and consequently is not transmitted to the machine upon which the attachment is mounted.

The face plates of the chucks are interchangeable and removable, so that, though they are of liberal thickness to withstand wear and loss of metal from resurfacing, when the time does come that they are worn down to the limit, they may be replaced quickly. They are held in position by screws entering from the underside, so that there are no screw holes on the face through which water might finds its way. The rectangular or flat chucks are provided with adjustable side and end stops for holding and locating work, which is a desirable

feature when in use on planing, shaping and milling machines. The rotary chucks have centering circles and a pilot hole in the center.

An interesting example of the use of a rotary chuck mounted on the spindle of a Heald internal grinding machine is shown. It is holding a 15-lb. steel casting of a magneto frame 11 in. in length and having a 5½-in. hole. The closed end, with its small central hole, was only ⅛ in. in thickness, excepting, of course, at the circumference. This end was in contact with the chuck. The result was wholly satisfactory. The time required to grind the hole, removing 0.011 in. of stock, was 9 min. A scraper bed equipped with a 10 x 30-in. magnetic chuck, an adaptation which should result in important economies in scraping, is also illustrated.

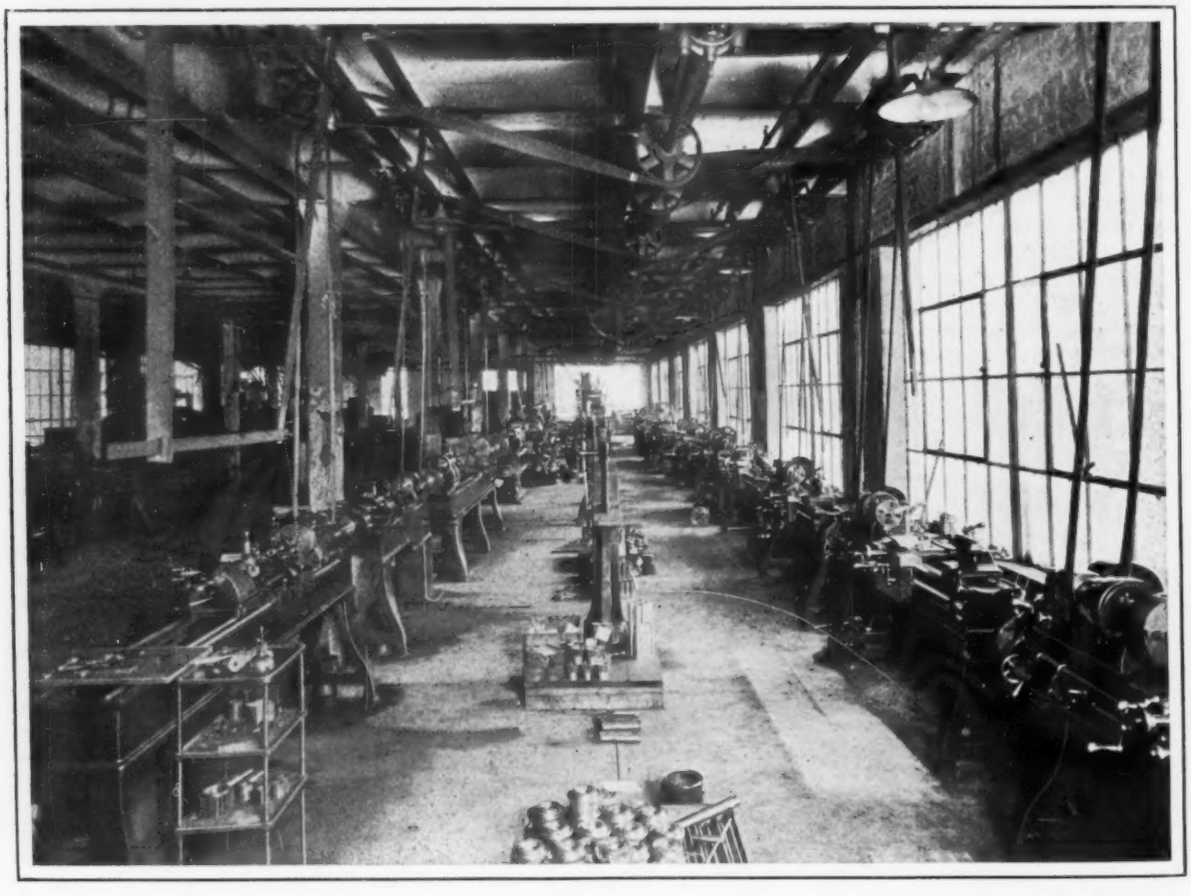
Replacing a Burned Manufacturing Plant

Factors Considered by the Cincinnati Pulley Machinery Company — Fire Protection a Feature — Home-Made Cooling Tower

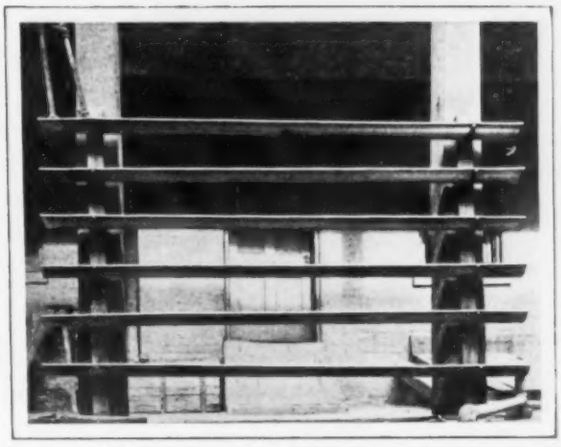
In preparing plans for rebuilding the plant of the Cincinnati Pulley Machinery Company, Covington, Ky., the management decided on a structure of a different type from the old building that was destroyed by fire about 18 months ago. The vexatious delay in making shipments on orders previously booked convinced the company that it was not possible for any live manufacturing concern to cover all losses by fire with an insurance policy. This is a question that many manufacturing firms have overlooked.

The new plant is 50 x 192 ft., two stories, with a basement in the front end. It is of regular mill construction and is equipped with a sprinkler system throughout, while factory hose is provided at different intervals for emergency use. The motive power of the plant is a 75-hp. electric motor, driven by an 85-hp. Nash gas engine. The overhead shafting on both the first and second floors is arranged for group drive.

Probably the most efficient and cheapest cooling tower that could be used for reducing the temperature of the water circulating through the gas engine cylinder jackets is installed here. It consists of a series of eaves troughs, with closed ends, with the bottom of each trough perforated, so that when the hot water is discharged into the top gutter it drains through to the trough below. From the bottom trough which has no perforations it is returned to an underground cistern and pumped back through the system. With an arrangement of this kind during the hot summer months extra cooling troughs can be added at very little expense. This home made apparatus has enabled the company to cut its water bill to a minimum, as the loss from evaporation is very little, and only once a week has



The West Bay of the Shop Showing the Arrangement of the Machines at Either Side and the Space in the Center Which Is Utilized for Piling Unfinished and Finished Stock



A Home-Made Cooling Tower for the Gas Engine Jacket Water Composed of Eaves Troughs

it been found necessary to fill the cistern from the city's water mains.

The west bay of the shop is arranged with machines on each side and sufficient space in the center for piling unfinished and finished stock. The finished parts are transported to the assembling room on the second floor on hand trucks that are pushed on an electric freight elevator which serves the two floors.

At the rear end of the assembling and testing room is the shipping department, located close to the elevator. The company is devoting most of its time to the manufacture of sensitive drilling machines, and while its receiving and shipping departments are located in the rear of the plant, work has been so outlined that a heavy rough casting is finished on machines near the point of entry, while the lighter parts are machined near the front end. The elevator for transporting machine parts to the assembling floor above is located at the rear end, so that the arrangement noted reduces the hauling of heavy pieces to a minimum.

The company's offices are located in the front end of the building. The superintendent's office adjoins the main offices, but is so situated that he has an unobstructed view of the operating floor. The workmen's washroom is located in the basement and is equipped with individual wash basins and metal lockers.

N. & G. Taylor Company's Improvements

The N. & G. Taylor Company, Philadelphia, has awarded a contract for a 100-ft. addition to the open-hearth steel department of its works at Cumberland, Md., to provide space for another 25-ton basic furnace. The building will be of structural steel sheathed with corrugated galvanized sheets, to be erected by the Belmont Iron Works, Philadelphia. The new equipment will include a 40-ton overhead traveling crane with a 7½-ton auxiliary hoist, built by the Alliance Machine Company, Alliance, Ohio; a standard high type four-motor open-hearth charging machine, built by the Wellman-Seaver-Morgan Company, Cleveland, Ohio; a full supply of charging boxes, narrow-gauge locomotive trucks and two 30-ton ladles. The power plant will be enlarged by a 24 x 24-in. piston valve heavy duty Harrisburg engine, directly connected to an eight-pole engine type Crocker-Wheeler 300-kw. generator. A new motor-driven shear, manufactured by the Long & Alstatter Company, Hamilton, Ohio, will be added to the bar mill. The enlargement of the open-hearth department will nearly double the present output of steel. The improvements are expected to be completed by early autumn.

The Great Northern Plating Works, Chicago, announces its removal to its new plant at 2500 Ogden avenue, corner of Campbell avenue.

By-Products From Producer Gas

The issues of Stahl und Eisen for March 19 and April 2 contain an extensive article by Otto Wolff on the obtaining of by-products from the producer gas made in iron and steel plants. In the introduction the consumption and production of ammonium sulphate is given in detail for Germany and other countries. If all the nitrogen contained in the average Westphalian coal could be recovered as sulphate it would amount to about 70 kg. per ton, worth about 19 marks; that is, it would be of more value than the coke. The average production per ton is only 12 kg. of sulphate, 750 kg. of coke, 5 kg. of benzole, 25 kg. of tar and 150 cu. m. of excess gas. If this gas were burned in gas engines and electricity produced and sold at 2 pf. per kw-hr. the value of the products from the ton of coal would be 22.92 marks. If the coal were gasified in producers and the by-products obtained, experience has shown that 45 kg. of sulphate would be obtained, which alone would be worth about 12.50 marks. At the same time 4000 cu. m. of gas would be obtained which if transformed into electricity and sold, as in the case of coke-oven gas, would give a value to the products from a ton of coal of about 42 marks ($10).

The well-known Mond process is then described in some detail with reference to the existing plants, most of which are in England. The newly worked out Lynn process is then taken up, which does not differ from the Mond process in principle, but in the construction and arrangement of the plant. Less room is required, and better heat economy is obtained. The first plant in Germany was erected at Waldhof. It has been in operation about 2½ years, and the producer practice, together with the sulphate production, has been satisfactory from the beginning. A plant is also under construction for a German steel works to furnish gas for three open-hearth furnaces and six heating furnaces. Tables are then given to show the importance of a constant and so far as possible maximum burden on the plant to insure economy. This can be attained in steel plants by using the gas both in furnaces and in centrally located power plants. In favorable cases 1 cu. m. of producer gas can be made for 0.18 pf. compared with 0.38 pf. for the ordinary process, and by using gas engines 1 kw-hr. will only cost about 1 pf. (0.24c.).

Record Life for a Blast Furnace Lining

The long life and slow life of which British iron masters boast, in giving records of blast furnace linings, is strikingly exemplified in this paragraph from the London Ironmonger: "Cochrane & Co. on May 29 put out of blast the No. 2 furnace at the Ormesby Iron Works, Middlesbrough, for re-lining. The furnace was blown in on May 8, 1876, and has been in blast for over 38 years, which is a record of life for a blast-furnace lining throughout the world. The total make of pig iron for the period was 1,365,387 tons. The furnace was only damped down during the Cleveland miners', the Durham coal, the Northeastern Railway, and the national coal strikes."

The Pittsburgh Crucible Steel Company's furnace at Midland, Pa., which was blown out April 30, 1914, after a campaign of 7 years 7 months and 14 days, had made 1,053,673 tons of pig iron on one lining. This was an exceptional performance but the record was not the greatest that has been made in American blast furnace practice, the motto in this country having been for many years, "A short life and a merry one."

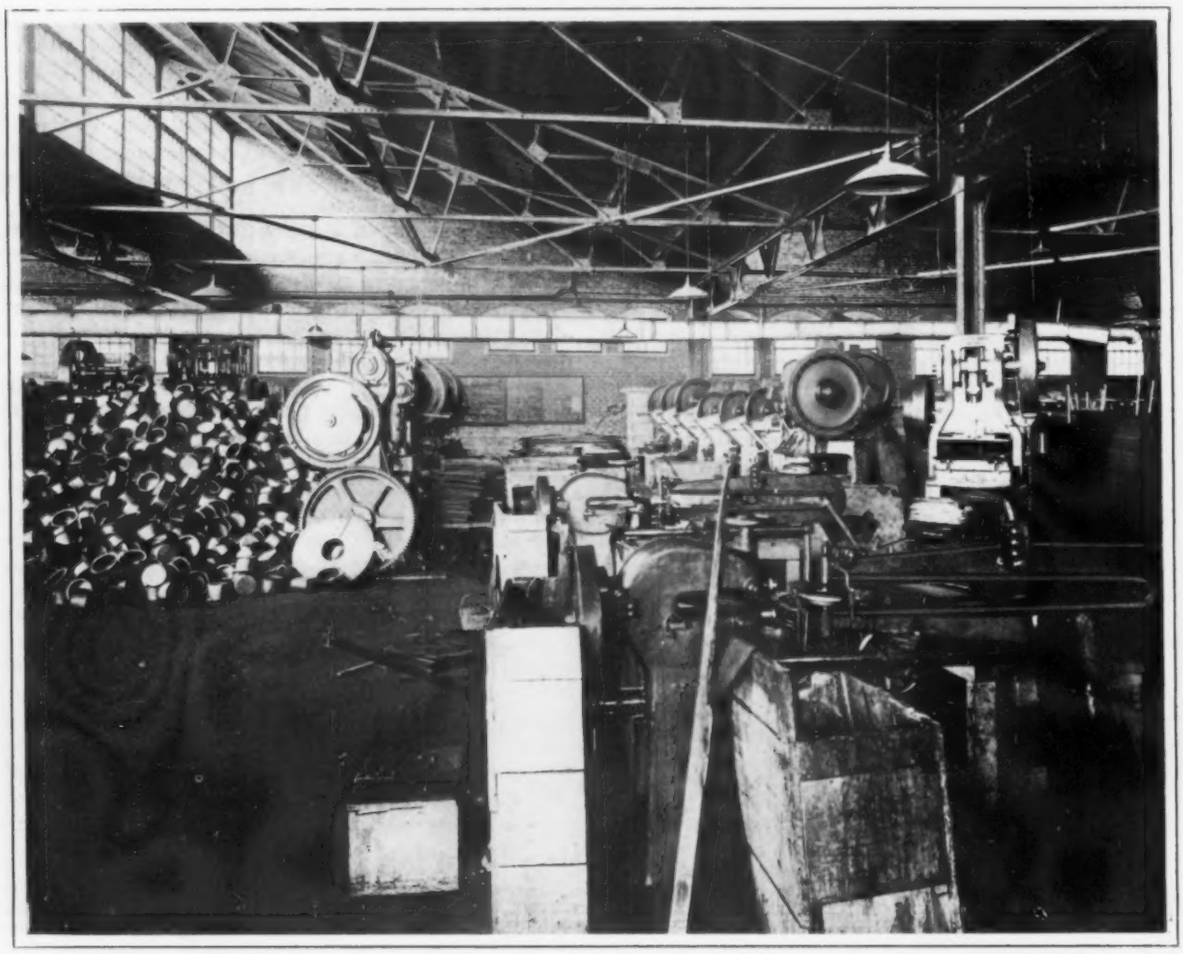
The Bingham Mfg. Company, maker of automobile accessories, has leased the plant of the Electric Locomotive & Engineering Company, Cleveland, Ohio, and will shortly begin the manufacture of motor trucks.

The Manufacture of Gray Enameled Ware

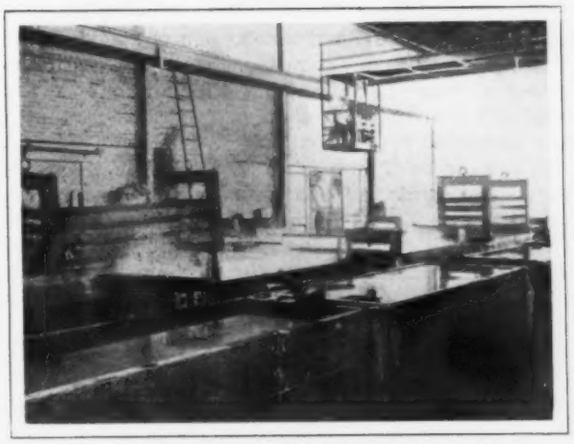
Interesting Press Room in Plant of General Stamping Company — Motor Drive from Basement Eliminating Overhead Shafting

Rapid strides have been made in manufacturing economics in the past few years, but it is safe to say that in no line of manufacturing has the cost of production been reduced more rapidly than in the production of enameled kitchen ware. The housewife wonders at the bargains she is getting when she purchases a gray enameled stew pan for 10 cents when she compares her purchase with what she had to pay for a similar article a few years ago, but probably does not realize that the reduced cost of her kitchen utensils is due to the manufacturing processes that have greatly lessened the cost of production and at the same time have improved the quality of the ware. Probably in no line of manufacture is competition keener. Goods are sold in large lots at not a wide margin of profit and the manufacturer to be successful must bring his cost of production down to the minimum by having the maximum plant efficiency, which includes plant arrangement and management and the installation of modern machinery and various labor-saving equipment. As the cost of enameled ware has declined the demand for it has increased and the output of a large up-to-date present-day plant is enormous.

The latest addition to the plants making gray enameled ware is that of the General Stamping Company, Canton, Ohio. Being the last built, it is claimed that this is the best plant of the kind in this country and that it is unexcelled by any of the European plants. An idea of the extent of the enameled ware industry is shown by the fact that this plant was designed for a maximum output of 100,000 pieces per day. Its product is what is known to the trade as one-coat ware, being given but one coat of enamel. As a sheet metal working plant the factory has a number of interesting and original features designed both to make the cost of production as low as possible and to eliminate the danger from accident. The plant occupies approximately 4 acres of ground on a site adjoining the Pennsylvania Railroad and consists of a number of group-arranged buildings providing a floor space of 135,000 sq. ft. The buildings are one-story structures, a few of them also having basements. The principal buildings are the stamping department, 100 x 288 ft.; dipping and drying building, 130 x 250 ft.; pickling department, 42 x 100 ft.; furnace building, 130 x 250 ft.; packing and shipping department, 250 x 168 ft.; machine shop,



One End of the Pressroom Showing the Disk Blanking Presses and Circle Shearing Machines and the Chute for Conveying Scrap to the Basement in the Foreground



View in the Pickling Department

42 x 50 ft.; mill room or grinding department, 27 x 75 ft., and office building, 27 x 98 ft. There are also a mixing building, boiler house and other small structures. The general type of construction is brick and concrete with steel roof trusses and sawtooth roofs. These roofs all face the north and provide a large amount of skylight surface.

The buildings have 13-in. brick walls, the larger structures having 48 x 48-in. and 48 x 36-in. pilasters spaced 20 ft. and the roof trusses are supported by steel columns spaced 40 x 50 ft. The general type of roof construction is 1⅛-in. pine covered with corrugated steel, the sheet steel used for the roof and in other parts of the plant being Toncan metal made by the Berger Mfg. Company, Canton, Ohio. The floors are of ⅞-in. maple laid on concrete and cinders. The furnace building has a ⅜-in. iron floor laid on concrete and supported by steel joists. The roof of the pickling building is of the monitor type supported by wooden trusses and has a plank floor laid on 2 x 8-in. beams resting on concrete. The grinding room has a concrete floor. In this are located two specially designed mills, one 6 ft. and the other 7½ ft. in diameter, for mixing enamel. The mixing building adjoining the mill building is a two-story structure, the upper floor being used for storing chemicals used in the manufacture of enamel. This floor is served by an electric elevator.

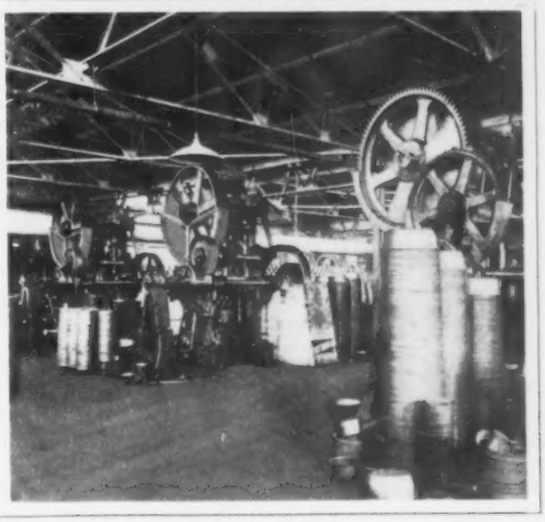
The plant is arranged throughout for the convenient and economical handling of material in the process of manufacture. Work goes through the different departments over a route somewhat resembling the letter U, the finished stock coming back to near the starting point. Depressed switch tracks enter the plant both in the receiving and shipping departments at the end of the building occupied by these departments so that the floors of the cars and loading and unloading platforms are on the same level, and loading and unloading is done under roof and close to the manufacturing department. In the shipping department there is space to load 12 cars. Adjoining the unloading platform at the end of the stamping department a large space is provided for sheet storage between the unloading platform and the presses. Open-hearth sheet stock is used, this being pickled and annealed for deep drawing and of special analysis. This material comes from the mills in squares ranging from 10 to 24 in. in size and in gauges from No. 24 to No. 28.

A distinctive feature of the stamping room is that all presses are belt driven from beneath the floor so that overhead shafting and belting are entirely eliminated. The shafting and motors are located under the floor, some in the basement that extends under a portion of the building and the remainder in small concrete conduits that extend from the basement at right angles. This arrangement of under-floor drive does away with a certain amount of danger; there is no oil dropping from shafting, the roof trusses are not so high as would be necessary to provide room for shafting and the press room is far more sightly than it would be with overhead belting and shafting.

The presses are driven in groups of three by 40-hp. motors, using alternating current at 220 volts. The electricity is furnished by a public service company. The transformer and main switchboard are located in a detached fireproof building. The belting from the floor up to the driving wheels is inclosed by wooden guards. In addition to the usual safety devices, each press has a foot lever so that it can be stopped by foot pressure should both of the operator's hands become caught in the machine, and all set screws are being covered with caps to eliminate danger from that source by clothing of workmen getting caught.

Another interesting feature of the press room is the method employed in handling scrap. Wooden chutes are built alongside of the blanking presses and shearing machines and all scrap falls directly from the machines down through these chutes to the basement floor, where it is gathered up and baled by a baling machine furnished by the Logeman Bros., Milwaukee, Wis. This machine is operated by an electrically driven hydraulic pump. The scrap is bound in bales weighing from 75 to 100 lb. and is conveyed to a car on the side track a short distance from the basement door. As the scrap products amount to about 7 tons per day, the arrangement for chuting it into the basement saves considerable labor and the press room floor is kept entirely free from scrap. A further saving of labor in this connection will be provided by the installation of an automatic conveyor for hauling the scrap in the cellar to one central point near the baling machine.

The first operation in the pressroom is blanking the disks. This is done for the most part with circular dies on blanking presses, but if a special size is to be blanked for which a die has not been made the blanks are cut out on circle shear shearing machines. The blanks range from 6 to 48 in. in diameter and then go to large toggle drawing presses where the metal is drawn to the required shape, the drawing requiring from one to four



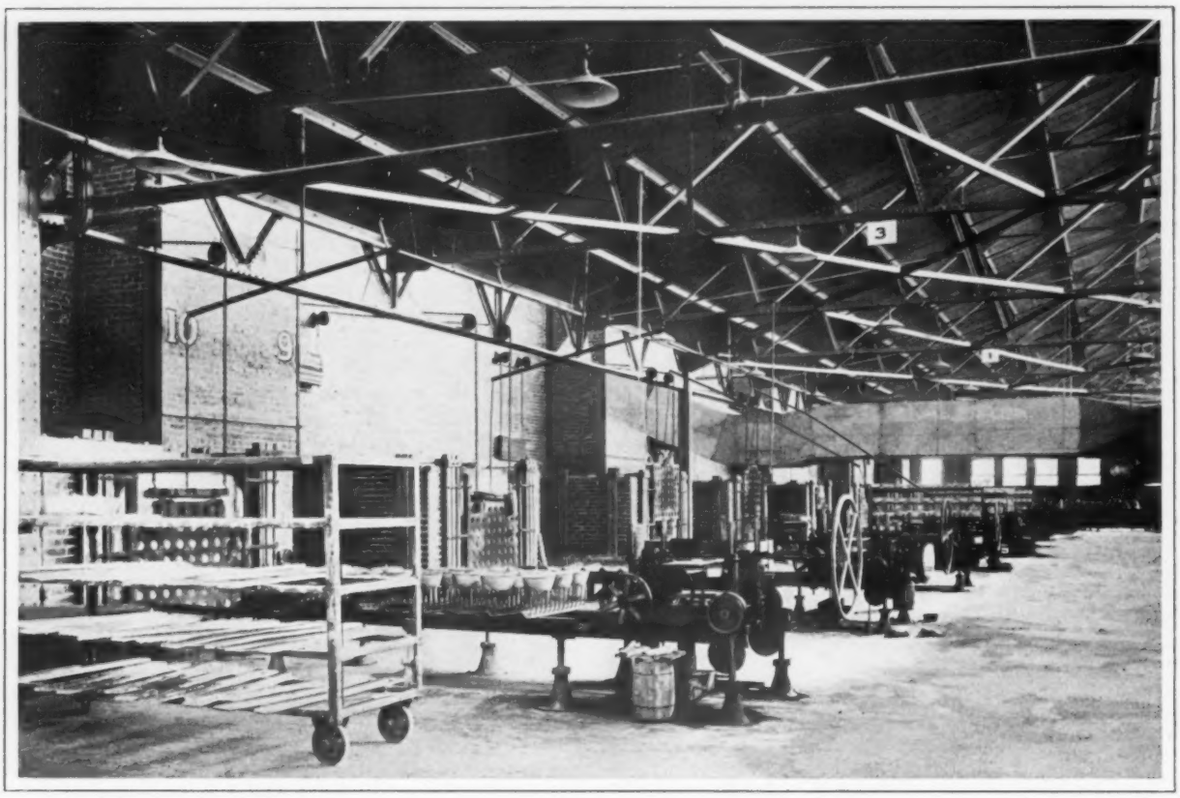
A Portion of the Pressroom Showing Some of the Large Toggle Drawing Presses All Belt Driven from Beneath the Floor

operations, depending on the article being made. There are 12 of these large drawing presses varying somewhat in size. These and all other press equipment were furnished by the Toledo Machine & Tool Company, Toledo, Ohio.

After being drawn the shapes go to the spinning and heading department where they are placed on spinning machines to smooth out the wrinkles in the metal. Then they are beaded around the edge, after which they are taken to the stockroom, having in the various operations gone the length of the press department from the stock unloading platform to the shape storage bins at the opposite end. It is the intention to install an automatic conveyor for conveying the shapes to the stock bins after they leave the beading presses.

Near the storage bins is the finishing department where there are a number of presses for the various finishing operations. The final press room operation is welding trimming parts to the shapes. Such parts as ears, which are subject to only an upward strain, are spot welded to the utensils, but handles that must stand an outward strain or pull also are acetylene welded. For spot welding the plant is equipped with seven machines made by the Toledo Electric Welder Company and the Winfield Electric Welding Machine Company. There are six acetylene torch stations supplied from a generator in the basement that has a capacity for 24 stations.

From the press department the pressed and finished shapes go to the pickling department adjoining in which are located 44 pickling vats, 72 in. long, 36 in. wide and 30 in. deep, arranged across the room in four rows. The pickling operation requires the submersion of the ware in three tanks containing certain solutions and a fourth tank containing water for removing the solutions. Ware is handled in the pickling department entirely by a 2-ton electric traveling crane with a 36-ft. span and operated from a cab. On one side of the pickling room and extending in a straight line across a court to and along the sidewall of the dipping department is a telpher or monorail system electrically operated by a man who travels with the conveyor in a cab. The crane in the pickling department and the telpher system were installed by the Euclid Crane & Hoist Company. The conveyor which has a capacity of 1500 lb. carries the pickled ware in boxes to the dipping department where it is dipped by hand in tubs containing enamel located alongside the telpher runway. These are galvanized tubs slightly larger than wash tubs. The liquid enamel is about the consistency of cream and a creamy white in color. After being dipped the ware is placed on steel racks and wheeled to the adjoining drying room where it remains about 1½ hr. The drying room is kept at a temperature considerably higher than that of the adjoining room. When the ware is thoroughly dried the loaded racks are pushed through to the furnace room located between the drying and sorting rooms and about in the center of the plant. Here the ware is burned or baked from 2 to 5 min. at a very high temperature. The ware is charged in the furnace with charging machines and on specially designed charging forks. There are 12 burning furnaces, 12 ft. long, 4 ft. high and 4 ft. wide.



Furnaces for Baking the Enamel, Charging Machines and Forks and One of the Trucks on Which the Ware Is Dried and Brought to the Furnace Department

The furnaces are coal burning of an improved muffle type and were installed by the Massillon Stone & Firebrick Company, Massillon, Ohio. They are fired from the coal storage floor above the furnaces. As an improvement in the usual practice of shoveling coal in the furnace the fuel is placed in hoppers above the furnaces, into which it is fed automatically. Coal is delivered to the coal storage floor by a monorail crane carrying a 2-ton grab

bucket that takes the coal from a hopper beneath a railroad switch track, the fuel being discharged into the hopper from a bottom-dump car.

After being fired the ware passes on trucks to the sorting room where it is labeled and wrapped and placed in wooden bins 3 x 4 ft. in size and 8 ft. deep, built three tiers high. The bins are open on each side so that stock placed in one side of a bin is taken out of the other. In this way finished stock is not allowed to stay indefinitely in back of the bin as it often would in bins of ordinary type. Running along one side of this room back of the storage bins is a railroad track on which cars are loaded for shipment.

The heating system is unique in that the entire plant is heated with waste heat from the furnaces, and the drying room is similarly heated. While this has proved generally satisfactory most of the time the heat was found insufficient to maintain the desired temperature during coldest weather and an auxiliary heating system may be installed in some parts of the plant. Each battery of two brick-lined steel furnace stacks is inclosed on the outside with brick, forming an inclosed space with an area of 24 sq. in. between the outer wall and the stacks inside. The heat passes through the stacks into this inclosed space and is drawn from an opening in the side by an American Blower Company's 48-in. Sirocco fan and it is forced throughout the plant through 48-in. conduits located in the roof trusses and having discharge outlets as required. To provide a freer circulation in the drying room several fans are located in the outer wall of this department just below the floor level. These fans exhaust the cooler air through ducts near the floor to the outside of the building.

Adjoining the press room is a complete machine shop equipped with standard machines all having geared heads. The sanitary arrangements throughout the plant are very complete and considerable attention has been given in other respects to the comfort of the employees. In addition to up-to-date toilet facilities, bubbling drinking fountains are provided and the girl employees have a commodious rest room.

The plant was designed by Z. W. Kent, engineer in charge of design and construction, in co-operation with T. M. Roseberry, the general superintendent.

October Meeting of Mining Engineers

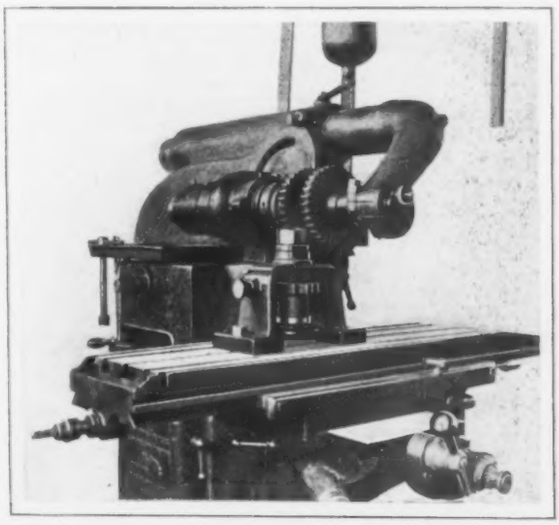
The American Institute of Mining Engineers will hold a meeting in Pittsburgh on October 8, 9 and 10 under the joint auspices of the iron and steel committee, the coal and coke committee and the committee on petroleum and gas. The iron and steel papers will probably be presented on October 8. Among those already arranged for are: "Iron Ore Reserves," by John Birkinbine, consulting engineer, Philadelphia; "The Finishing Temperatures and Properties of Rails," by G. K. Burgess, Bureau of Standards, Washington; "Surface Decarburization of Tool Steel," by J. V. Emmons, and "Notes on Roll Shells," by J. C. H. Ferguson. Papers on the Snyder electric furnace and on the Pennsylvania Engineering Company's duplex steel process plants have been promised.

The Peoria Produce, Iron & Metal Company, Peoria, Ill., has been incorporated with a capital stock of $10,000, to buy and sell produce, iron, metals, etc., by Max Cohen, Jacob Cohen and Isaac Cohen.

The Baltimore & Ohio Railroad Company has increased its force at its car shops at Washington, Ind., to get cars ready for moving the crops. The full force is on full time.

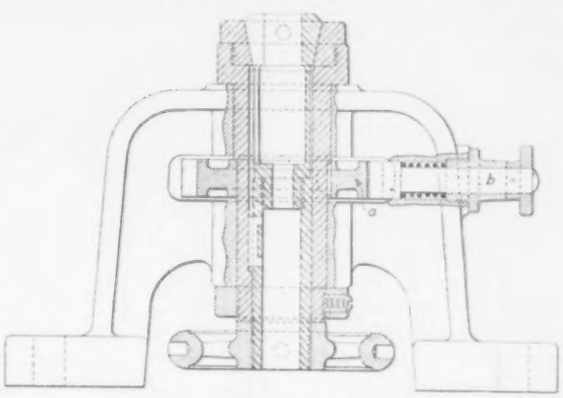
A New Attachment for Milling Machines

An attachment has been brought out by Edgar W. Bemis, 92 West street, Worcester, Mass., for use with milling machines, lathes or drilling machines. A feature of the attachment is its value in experimental or tool work, because a piece may be transferred from one machine to another, from a milling machine to a lathe or drilling machine, for example, without removing it from the chuck.



A Recently Developed Attachment for Holding Work During Machining Adapted for Milling Machine Practice

It consists of a frame carrying a hollow spindle, inside of which is a sliding spindle that is threaded into a handwheel. Collets of standard make, holding pieces from 1/64 to ⅞ in. in diameter, may be screwed into this spindle and are drawn in by the handwheel. Mounted on the hollow spindle is an index wheel, *a*, having notches cut at 45 and 60 deg. angles, into which fits the spring pin *b* to hold the spindle in the desired position, especially when used on a milling machine for straddle-milling nuts, either square or hexagon.



Details of the Indexing Mechanism

A steel tower 1092 ft. high, or 100 ft. higher than the Eiffel tower, has recently been started at Laeken, near Brussels. The first rivet was driven in the presence of the International Wireless Telegraphy Commission. It is to be used for investigations in meteorology and wireless telegraphy.

The Nittany blast furnace, near Bellefonte, Centre County, Pa., was sold June 27 to F. L. Grosley, of New York, for the benefit of the bondholders. The price realized was $23,000 for the buildings and equipment, ore rights and timber land. The stack has been idle for over three years.

Results of Applied Scientific Management*

Control Plan Establishing When, Where and How Many of a Part Should Be Manufactured —Reduction of Capital Invested, One Result

BY GEORGE DE A. BABCOCK†

THE CONTROL PLAN

The last illustrations show the effect of time study on the workmen and cost of product, but there is a very much more important phase of time study

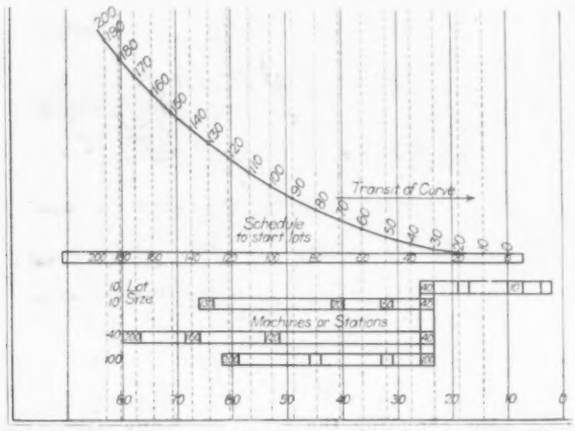


Fig. 12—Diagram to explain basis of the plan for controlling manufacturing

than this, viz.: The determination of the date for the different events in the process of manufacture; the reduction of capital investment due to the dependency of these dates.

Previously in this paper was mentioned the importance of analysis of product and the following description of the control plan rests upon this analysis:

The fundamentals of control are:

Characteristics of part to be made which includes form, material, method, place and time.

Quantities to be produced and the date of each event in the producing.

The date of the event is affected in addition by the rate of acceleration of production. This may be zero acceleration or uniform production. It may be uniformly accelerated production or it may be irregularly accelerated production. The last condition makes such a complete failure of an effort which purports to be manufacturing that I shall not discuss it further. The first or uniform production is probably the most economical one, but it precludes expansion of business and must necessarily be independent of any changeable outside influence. The uniformly accelerating is an ideal way for the expansion or the retarding of a business; the combination of, first, a period of uniformly accelerated production and then one of uniform production will take care of almost all the problems that must be met with in business.

From an analysis of a group of parts it is obvious that to produce the group at some particular time as a finished result we must work upon the individual parts. On each part we may require different methods and different lengths of time. There must be some particular data when each event on each part in the group must be done, so that the group may be finished at its particular date. That is, the raw materials must be requisitioned sufficiently early to allow the vendors to produce and deliver to our stores in time to go through production and assembly before the final date. This is true with each part.

The control board layout is made on this basis,

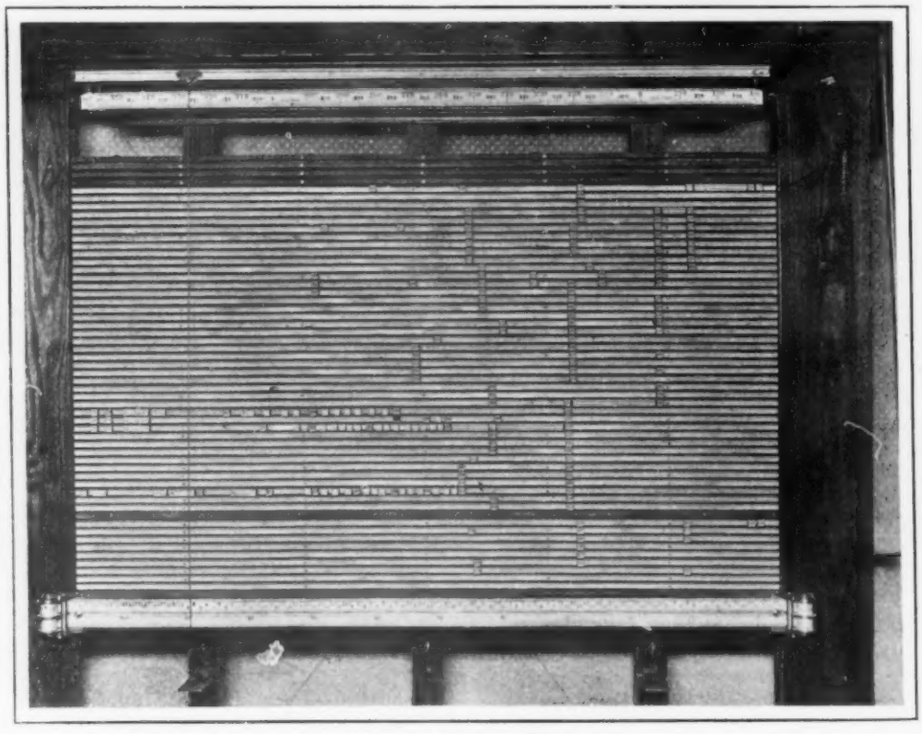


Fig. 13—The Master Control Board, 7x5 ft., in Size, Showing Among Other Things What and When Machines Are to Be Used for a Given Part, Whether Manufacturing Is Behind Schedule or Not, Etc.

indicated by diagram in Fig. 12. Horizontal distances are considered units of time. In the particular board as built, each ½ in. along the board represents a working day.

Each mechanical operation and every event for every part that goes into motor car construction is displayed. The particular place of each event on the

*Fifth installment of a paper to be printed in these columns substantially in full, presented to the National Metal Trades Association, Worcester, Mass., April 22. The first part, printed in the issue of June 4, told of the conditions which existed when it was determined to institute scientific management. The second part, printed June 11, covered largely the first steps taken. The third part showed the early results achieved and the fourth part was devoted to time studies.

†Production manager, H. H. Franklin Mfg. Company, manufacturer of the Franklin motor cars, Syracuse, N. Y.

board is marked by a machine symbol or symbol to represent the department or task. The placing on the board of the different elements is determined by time study. Up to this point the factor of date has not entered the problem, and the factor of time only is considered in the preparation of the board.

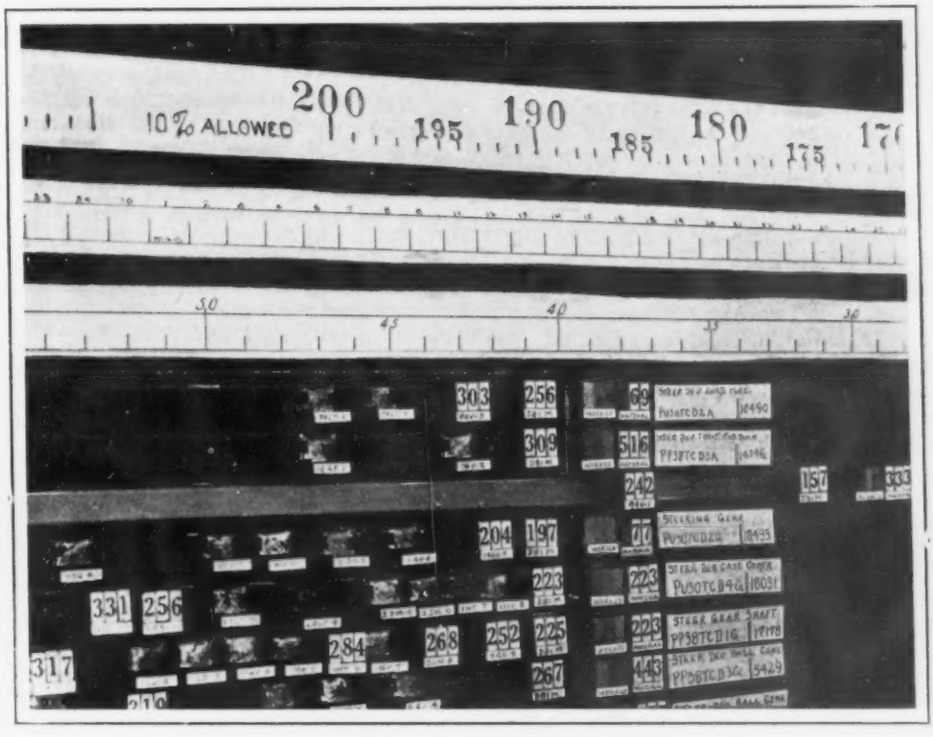


Fig. 14—Part of a 7x10-ft. Section Board

Our plan of manufacture is for stock, but according to a direct schedule. The schedule of the cars, with models and type, is specified by the general management and according to our fundamental of uniform production or uniform acceleration. If it is an accelerating production it can be represented by a curve as shown in Fig. 12, in which uniform intervals of quantity are laid off on the curve and then projected to the base line or tape. Acceleration of production begins at the earliest event rather than at the last event, as is usual under the old plan. The succeeding production is thus provided with a solid foundation for its support.

The central part of Fig. 12 shows a diagram of a few parts which make an assembly. It shows the position in the number of working days ahead of the finish time of the assembly that each event of each part shall take place. It shows further some value at the place of each event. These values show what have been accomplished with respect to the task as set by the tape.

The checking feature is this: The figure of attainment as posted in the station must correspond to the figure immediately above it on the tape. If the figure at the station is greater than that of the tape, the part is ahead of schedule—that is, the accomplishment is greater than expected, or, in other words, more parts have been finished to this point than planned for. If less than the figure on the tape above it, it is behind schedule. The number of working days ahead or behind schedule can be measured from the scale at the bottom of the figure.

It became evident from an early study of this plan that charts or drawings would not be sufficiently flexible to carry it out with economy and comfort, and a mechanical device was designed and constructed in our works which seems to have fulfilled this requirement perfectly. It is rather elaborate in its form. Fig. 13 will give a general idea of construction and layout. This illustrates the master control board, which is 7x5 ft. in size. The detail of the stations is shown in Fig. 14. The white block sets of each station, which includes the number and base marker, are ½-in. square and stand ½ in. out from the board.

The face of the board is made of ⅛ x ½-in. metal strips. The cages of vanadium steel can be clipped on to the strips at any point. The face of the strips can be slid horizontally and allowed to rest, thus changing the position of any particular part, but maintaining the time setting of each event of the part. The board can be opened at any place and one or more new parts inserted.

The complete record of our work is taken from these boards by photographs. The time saved by this and the fact that we pay no attention to items that are up to schedule have more than offset the cost of preparation of the equipment, and it is now a continuous asset.

The fact that all our data are displayed publicly to our supervising force and also that all individuals throughout the works receive their instructions from this source maintains a high degree of accuracy, much higher than we were ever able to obtain when using paper records.

From the standard board as shown and through the mechanism of the board are prepared the manufacturing orders, job cards, stores issues, move tickets and tags. Any set rate of acceleration or uniform effort can be changed by the production manager inside of a few hours, and the whole scheme of date of production can be changed within 20 days to agree exactly with the new plan, and this without confusion. If we wait 20 days after any such change, the orders in the works will have expired and the new orders with new dates will follow into process.

It is, of course, desirable, as mentioned above, to have uniform production, or uniformly accelerating production. Analysis of the product developed the fact that 60 per cent. of the cost of the materials going into the product was contained in 59 out of approximately 1051 parts. That of these, 44 parts and one-half of the material cost went into the car on the assembly floors as finished purchase parts. Practically all of the other parts represented relatively so small a material value that we could operate our producing labor on a strictly uniform schedule or uniformly accelerating, but make the final assemblies of parts on a variable schedule. These variations, of course, should not be so violent as to change workmen on our assembly floors throughout

the season more than 30 per cent.—i. e., we should not change more than one man in every three on the assembly floor, but instead maintain two-thirds, or 60 per cent., of our fixed force of trained men. The capital investment in the parts which are worked upon by the direct labor is relatively small, and the carrying of this investment does not prove to be a burden.

As to how this control plan of supervision can master its problem we show in Fig. 15 a schedule of uniformly accelerated production under which we are now working. The dotted line, Curve A, is the line of uniform acceleration of cars per week. The lower curve is a summary of this, while the broken zigzag line is our accomplishment toward the acceleration in the new 1914 car. The cause of this wide variation in this last curve is due usually to single items, such as are noted on the curve. They do not in any sense represent the productive effort.

Due to the fact that the production of a given model of car from its inception to its finish is over a long period of time we have developed frequent checks as to our accomplishment in addition to the control board. This is illustrated by Fig. 16. As the lots are maintained of uniform size, and lot size of assembly or part is made by subdivisions or multiples of the lot size of the car, they represent a convenient index of our effort. This is very noticeable when comparing the curve of "lots finished" to the curve of "daily cars produced passed sales." The cost of the car is readily indicated by the "Producing hours per lot finished" when we know the lots required per car and the average workmen rate per hour.

(To be continued)

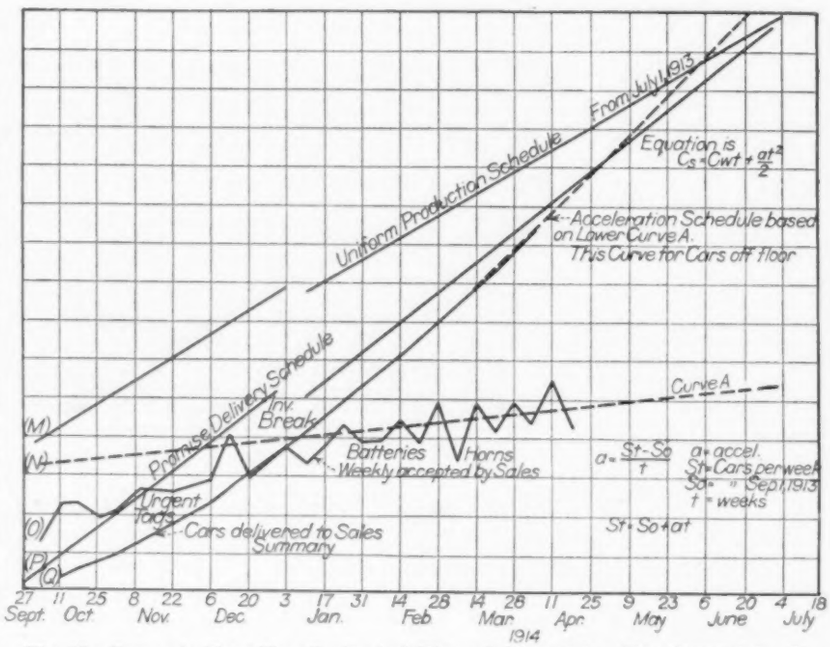


Fig. 15—Curves to Show How the Control Plan of Supervision Has Succeeded. In the above notations for the curve of uniform acceleration, C_s = cars to be delivered for shipment, and c_w = weekly rate of production of cars at the beginning of any time t

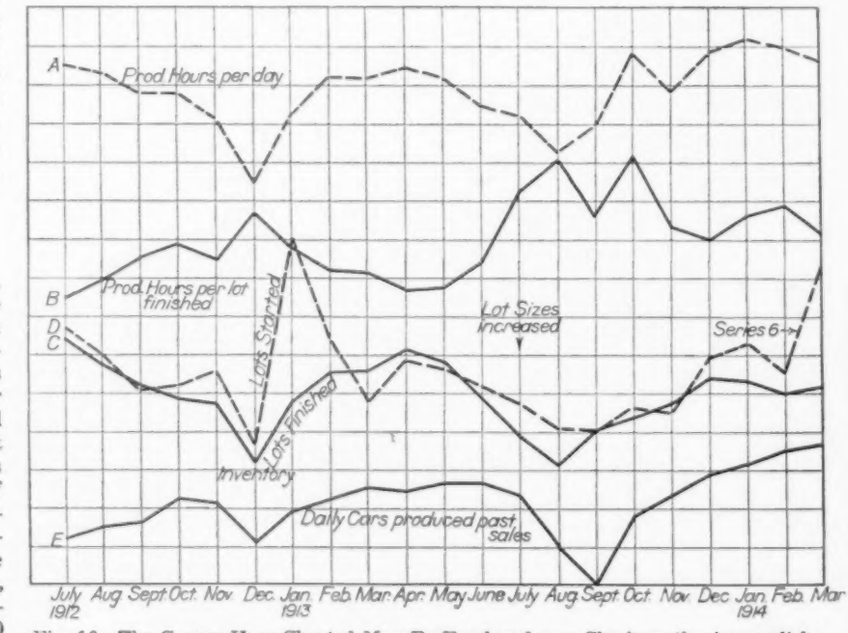


Fig. 16—The Curves Here Charted May Be Employed as a Check on the Accomplishment in Addition to the Control Board

The Burt Mfg. Company, Akron, Ohio, has just shipped 13 metal top 36-in. ventilators to the Modern Steel Structural Company, Waukesha, Wis., and its recent orders include four 48-in. ventilators for the Asbestos Protective Metal Company, Grand Saline, Texas. It has installed 48-in. fan ventilators in the boot and shoe department of the Goodrich Tire & Rubber Company, Akron, and is installing a 48-in. fan ventilator in the plant of the Buckeye Aluminum Company, Wooster, Ohio. Among other orders recently taken is one for 20 filtering sets for the barge canal in New York.

The Traylor Engineering & Mfg. Company, Allentown, Pa., announces that it has made arrangements with Charles A. Jacobson for the manufacture and sale of the Jacobson gas engine and Mr. Jacobson will be engaged together with the Traylor Company's organization in the design, construction and sale of this engine. It is of the scavenging type and uses natural, producer or illuminating gas. The engine is built with single and multiple cylinders and is adapted for direct connecting to alternators running in parallel.

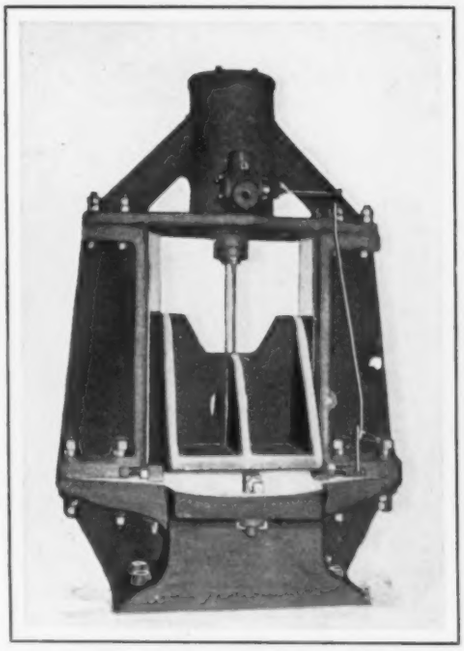
Another Blast Furnace at Cleveland

Corrigan, McKinney & Co., Cleveland, Ohio, have sent out specifications for their No. 3 blast furnace. Several months ago they announced that as soon as plans were prepared they would build two new furnaces in connection with their new steel plant now under construction in Cleveland. The No. 3 stack will be built at once but the erection of the No. 4 stack will be deferred until No. 3 is completed. Successful bidders will be asked to bind themselves to a duplicate contract in connection with the second stack, subject to the firm's option. The new stack will be 21 x 90 ft., with a hearth 16 ft. in diameter and a rated capacity of about 600 tons per day. Contracts for the steel work, stoves, skip hoists and some other equipment will probably be placed in about two weeks. The boilers were purchased some time ago.

The Temple Iron Company expects to blow out its furnace at Reading, Pa., this week.

A New Steam or Air Lift Drop Hammer

The Henderson Machine Company, 5032 Germantown avenue, Philadelphia, Pa., has designed a drop hammer which lifts by steam or air and is



An Improved Form of Drop Hammer with a Steam or Air Lift Which Weighs Approximately 40,000 Lb.

capable of rapid handling particularly where it is necessary to raise the hammer a slight amount and drop it repeatedly. The hammers are made in sizes up to a face measuring 46 x 72 in. The weight of the hammer is 10,000 lb., and the entire weight is approximately 60,000 lb. The hammer illustrated weighs about 40,000 lb., and has a face measuring 36 x 60 in.

Titanium-Treated Rails

The Titanium Alloy Mfg. Company, Niagara Falls, N. Y., has recently issued its sixth booklet, entitled "Rail Reports, Bulletin No. 6." It is a continuation of a comparative examination of standard carbon rails and of rails of the same general composition treated with titanium, the rails in each case having been rolled for some representative railroad system. This bulletin reports on three standard and three titanium-treated open-hearth rails, rolled in September, 1913, for an Eastern railroad. The same general conclusions are arrived at as in previous bulletins. The treated rails are found to be more ductile than the untreated, for about the same tensile strength, and the hardening elements are slightly less segregated than in the untreated. In the treated rails the hardness is found to be better distributed, as shown by the scleroscope tests. An important feature brought out in this series of tests is the reported difference in the size and distribution of the sulphide inclusions to the advantage of the treated rails, as shown by sulphur prints and photomicrographs of the unetched steels, which are of the high standard of excellence of the previous bulletins.

The Northern Trust Company will sell on Friday, July 3, the property of the Reedy estate, 100 x 100 ft., at 213 West Grand avenue, Chicago, including the land and a brick foundry building. The appraised value of the property is $50,000.

The H. W. Horst Construction Company has the contract for building the plant of the Tri-City Artificial Ice Company at Rock Island, Ill. The Arctic Ice Machine Company, Canton, Ohio, has the contract for the equipment.

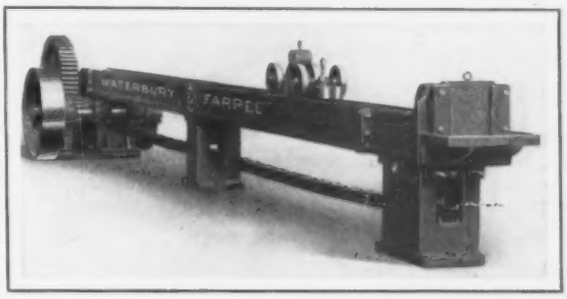
Improved Line of Chain Draw Benches

A new line of standard chain draw benches, which are to supplant its old style machines, has been placed on the market by the Waterbury Farrel Foundry & Machine Company, Waterbury, Conn. They are designed to meet the requirements of manufacturers of tubing, solid shapes and similar material and are built in three sizes, having pulling capacities of 10,000, 20,000 and 30,000 lb. on the chain. In addition to these new machines, four smaller sizes, having pulling capacities of 1000, 2000, 3500 and 6000 lb. on the chain, and two larger ones, having pulling capacities of 40,000 and 60,000 lb., are built to meet the requirements for similar machines for doing smaller and larger work.

Among the improvements that have been made in the machines are an improved chain drive of the two-in-one type, having drop-forged center links and bar stock outer links, the construction employed being relied upon to give large wearing surfaces between the chain and the sprocket. The hook and the chain are designed to minimize accidents on the refusal of the hook and chain to disengage at the end of the drawing stroke. The drive, which is compact and self-contained, includes an outboard bearing on the sprocket shaft to maintain the alignment of the gears while setting up or erecting. An improved type of wheel tongs, which it is pointed out can be returned more quickly than the older type of sliding ones, is included in the equipment of the machine. In addition to these changes, the whole machine is built stiffer and the main pinion is mounted between bearings on the shaft instead of being overhung.

Motor drive can be employed with the benches, the ratio of the gearing and the pulley sizes being designed so that ordinary commercial motors can be belted to the driving pulleys or the benches without alteration. The benches can be assembled either left hand or right hand, as may be desired, without any change in the castings, and the beds are constructed so that they can be lengthened out at any time to suit special requirements.

Sight feed oil cups for all bearings in the drive



One of a New Line of Chain Draw Benches Having Pulling Capacities Ranging from 10,000 to 30,000 Lb.

proper and the use of cut teeth on the driving and the main sprockets are relied upon to do away with much of the wear and the noise that formerly occurred. A steel channel underneath the bed is provided to support the chain instead of permitting it to drag on the floor, as was the case in the older machine.

The Bessemer plant of the Ashland Steel Company, Ashland, Ky., is again in partial operation after a shut down of about a month from lack of orders. The company makes steel billets, slabs and wire rods.

GEAR TESTING MACHINE*

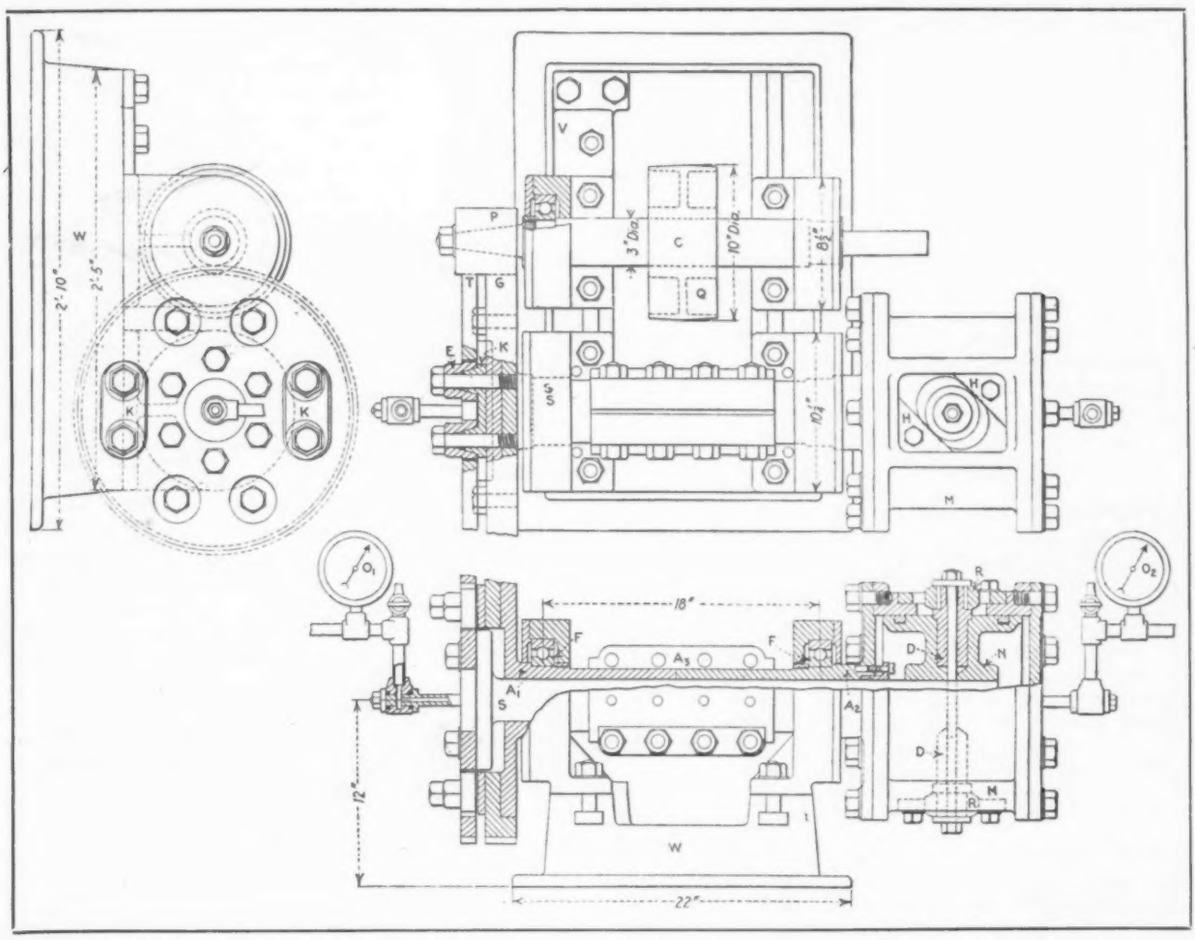
A Mechanism for Use in Determining the Strength of Gear Teeth

BY WILFRED LEWIS†

The gear testing machine, shown in the accompanying drawing, is the result of the writer's efforts to realize in concrete form an ideal machine for the purpose of continuing the experiments reported to the society by Prof. Guido H. Marx at the annual meeting in 1912. The possibility of testing heavier gears at higher speeds with comparatively little power occurred at once to Ralph E. Flanders and to the writer as pointed out in their discussions of the paper, but the problem remained to design a suitable machine which might also be used to supplement the experiments made by the committee on standards for involute gears to determine the friction losses and the running qualities of various types of gearing. After making a number of preliminary sketches the writer was about to put them in the hands of a draftsman, when he had the good fortune to meet Prof. E. P. Lesley, one of Professor Marx's associates, who accepted the task of preparing the working drawing. The machine as it now appears is due in large measure to his careful attention and skill in the perfection of every detail and the writer is pleased to acknowledge many helpful suggestions which have broadened the scope of the undertaking and made the design a practical possibility.

The machine proposed is based essentially upon the principle of the machine used in testing by the committee on involute gears, which is to put the teeth under a working load without consuming an excessive amount of power. The design, however, has been modified to facilitate changes in the working load and in the test gears employed. At the suggestion of Professor Lesley, it has also become possible, not only to change the amount of the working load while running, but also to change its direction, thus producing the effect of reversing loads upon the teeth while running continuously in the same direction.

The apparatus has a hollow shaft made in two parts, A_1 and A_2, united by a clamp, A_3, also made in two parts to facilitate assembling. At one end of this hollow shaft is a flange to receive the steel gear ring G, which serves as a permanent part of the apparatus and is strong enough to resist the stresses due to testing. Besides the hollow shaft A there are two solid shafts C and S on which are mounted the gears or pinions to be tested. The latter passes through the hollow shaft A and has a flange, at one end of which is mounted the test gear T. The shaft C, parallel with shafts A and S, carries the wide-faced pinion P, which is in mesh with both the permanent gear ring G and the test gear T. A and S are connected at their opposite ends by a novel device through which any desired amount of load in either direction can be applied to the teeth, whether at rest or while running in either direction. To accomplish this purpose, the hollow shaft A is flanged to receive the pneumatic cylinder M, in which is the piston N, firmly secured to the shaft S. Pins D D are driven



Plan View and End and Sectional Elevations of a Recently Developed Machine for Testing the Friction Losses and the Running Qualities of Various Types of Gears

*A paper presented at the recent spring meeting of the American Society of Mechanical Engineers.

†President Tabor Mfg. Company, Philadelphia, Pa.

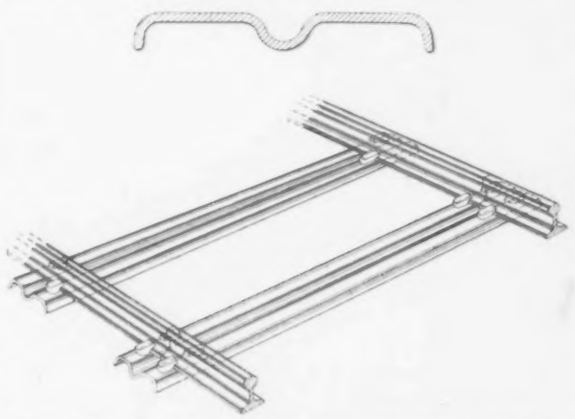
into the piston *N* through the openings in the cylinder *M* and upon the projecting ends of these pins rollers *R R* are mounted upon roller bearings. A bolt passing through the pins, piston and shaft secures the whole in place. These rollers *R R* engage helical segments *H H* let into the walls of the cylinder *M*. Air pressure can be applied to the piston *N* on either side to give a slight amount of end motion to the shaft *S* and so, through the action of the rollers upon the helical segments, a slight angular motion is produced between shafts *A* and *S*, resulting in a pressure between the teeth of the gears upon these shafts and the teeth of the pinion on shaft *C*. Pressure gages O_1 O_2 connecting with each side of the piston area are calibrated to record the resulting pressure on the gear teeth, taking account of the piston areas, the pitch of the helical cams *H* and the diameter of the gear wheels.

Since but little power is required to drive the apparatus, the pinion *P* is simply clamped to the shaft *C* by a nut on its tapered end. The shaft itself is made heavy for the sake of stiffness and a pulley, *O*, between bearings, is attached for driving from a countershaft, or if preferred a motor drive may be used in connection with the extended end. When the gear wheel *T* is to be tested, the intention is to use it in connection with a steel pinion; and when the pinion *P* is to be tested, the intention is to make it of cast iron and cut down the width of the teeth engaging with *T* by nicking down on either side to a smaller width of face. When a tooth breaks in the wheel *T*, or in the pinion *P*, it is important, to avoid the complete destruction of the apparatus by the jamming of the remaining teeth on their ends, to maintain the wheels *G* and *T* in proper relation to each other, and for this reason the stops *K K*, with their adjustable eccentrics *E E*, are employed. The block *K* is clamped to the wheel *G* through the intervening eccentric bushings *E E*. The intention is to keep one of the clamping bolts tight while the other is loosened and the eccentric adjusted to a predetermined amount of clearance on either side, after which both eccentrics are to be clamped. These stops do not come into action unless a tooth is broken or deformed. Then they cause both gears, *G* and *T*, to run together. By means of these stops it is also possible to study the effect of a predetermined irregularity in forming or spacing the teeth. For instance, an abnormally wide space or tooth can be simulated, when broken out or purposely cut away, by the position of the stops and the pounding effect in running will be evident as the result of a certain measured irregularity. The shafts *A* and *C* are mounted in ball bearings to reduce friction and as a matter of expediency the scale of the apparatus has been determined by the bearings *F F* on the shaft *A*. These are of the largest commercial size and to make them available the shaft *A* was cut in two and united by the clamp A_2. The bearings for the hollow shaft are firmly bolted and doweled to a bed plate, *W*, while those for the pinion shaft are adjustable to the diameter of the pinion used, a distance piece, *V*, of proper width being used in every case to prevent movement under load.

It will be seen that the apparatus is capable of determining to a nice degree of accuracy a number of unsettled problems of great practical importance at a very small expenditure for wear and tear and power. Jigs will be made for drilling the gears *G* and *T* after cutting the teeth, so that the relative positions of the two wheels may be accurately fixed. Friction is practically eliminated in the ball and roller bearings, and what remains must become inappreciable under the well-known influence of vibration when running, except that due to air resistance and the friction in the teeth. With some accurate means for measuring the power consumed, both of these variables can be determined better than ever before. The apparatus in skilful hands should therefore solve the mooted question of the effect of speed on strength, and questions of durability, wear and noise can be studied at a small outlay in power and materials. It is possible that some slight modifications may finally be embodied to facilitate construction, but the machine so shown is believed to contain the elements needed for an exhaustive examination of the subject of gearing in all its phases and the writer hopes it will appeal to some one interested, who has the means to build it and time to experiment on the lines so well indicated by Professor Marx.

A Steel Tie for Industrial Railroads

E. E. Slick, vice-president and general manager of the Cambria Steel Company, Johnstown, Pa., has developed a steel tie for light railroads. It is intended particularly for use where it is necessary to move portions of the track as work progresses, as



A Steel Tie for Use on Industrial Construction, Plantation and Mine Railroads

in general contracting work. It can be made for various gauges of track, although the sizes generally used are for 36 and 45 in. tracking. The ties are light in weight, as compared with ties of wood, and the rail fastenings are secured in place. They also are only about ½ in. thick, which gives a maximum clearance where the headroom is limited.

The ties are made in two styles, one for supporting the rails between the joints and the other for being placed under the rails at points where joints occur. The rails are held in position by buttons that are riveted in place. These buttons are adapted to be turned with comparative ease by an ordinary long handled wrench, and are put on in such a way that the friction of the rivet which holds them is relied upon to keep them in any position to which they may be turned. If desired, washers may be placed under the rivet heads, the washers being either flat or slightly bent or concaved before being riveted in place. It is emphasized that this latter type of washer gives a certain kind of spring action that provides a turning friction for the fastening, and at the same time the button can be turned without twisting off the shank of the rivet. In the joint type of tie four clips are provided at each end, two for each end of each rail. In this way, it is emphasized, the rails may be set end to end on the tie and made fast by the buttons, no fishplates or other rail splices being required.

Finding Cost from Selling Price

How to Appraise the Various Constituents of a Material of Mixed Quality According to Market Values of Products

BY STERLING H. BUNNELL*

If there are any two figures absolutely separate and independent from a costkeeper's point of view they are the figures of cost and selling price. Cost is made up of elements of purchased material, labor and indirect expense. Selling price is set by market necessities and in general bears no relation to cost except to be kept as far above it as possible, to avoid financial disaster. And yet there is a condition of manufacturing operation by no means uncommon, in which cost can only be found by calculation from selling price.

The writer met with the problem first in connection with work on an accounting and cost system for a large tannery. The investigation and solution of the problems of the tanning business disclosed the fact that other lines besides tanning are governed by similar conditions, and can make use of the same reasoning and the same cost-finding method. The tanner works with a material which is made up of pieces of widely different qualities, but is purchased in quantity for a lump sum. He manufactures 1000 hides into 2000 sides of grain leather and nearly as many "splits," which he finishes in 20 or more different styles, and grades into two, three or more qualities of each style. As the final result the hide material comes out as finished leather priced all the way from 5 cents to 30 cents per sq. ft., but all made from the unclassified lot of hides. The manufacturing costs of the several grades differ little from each other, so that recognition must be made of a difference in value of one hide as compared with another, in spite of the fact that all were purchased together for the same pound price. The only way in which the differences in values can be determined is by appraising the several hides on the basis of the value of the leather produced by each, which is in effect to figure back from selling price to cost.

MIXED MATERIAL AT A FLAT PRICE

The tanning business is only one of many which deal with a mixed material bought in mass and worked up into various grades of product. Among other lines of manufacture in which similar problems occur may be mentioned the production of the various distillates from crude oil, the manufacture of the numerous products of coal tar and every instance of the profitable use of wastes for by-products. In metal-working lines it is not uncommon to purchase the factory's entire requirements of castings at a flat price per pound, averaging the small with the large, the difficult with the easy. If the light and the heavy should be priced for sale from the same cost per pound for each the one would go too cheap and the other would be priced too high. A factory making light articles only would have to pay more per pound for its castings than a factory making heavy articles. There is no reason why a larger concern doing both kinds of work should not recognize that its casting costs are not equalized, but only averaged, and that the differences in value are just as real as if the different prices appeared on the purchase invoices.

*90 West street, New York.

As a matter of fact, the cost of an article is not always the amount paid for it. There may be an extra, contingent or indirect addition, or a rebate of some kind. An automobile may be bought for $2200 and sold after a year's use for $1200. Another may cost $1600 new and sell second-hand for only $300. The first has cost an even $1000, the second $1300, so that the higher-priced article in this case cost the least. Again, a dealer buys up the machinery of a factory at auction for a lump sum, and sells certain heavy tools for a sum equal to the price he paid for the whole lot. He cannot determine his profit on the sale until he has sold the remaining machines, or at least appraised them, so as to find what the larger machines cost him. In practice, a dealer buying a job lot first appraises the various items, then adds their values together, compares the total with the sum paid for the lot, and notes the percentage of "paper" profit. If the figures show that the price paid for the lot is 50 cents on the dollar of total value, it is perfectly clear that by selling each item for 75 per cent. of the appraisal value a uniform profit of 33 per cent. will be made. This is every-day business arithmetic, and is applicable to any case where a miscellaneous lot of goods is bought for a lump sum.

The method of appraisal is in effect to divide the total purchase price among the various items in proportion to the market value of each. If the items are, instead of finished articles, grades of material to be manufactured into various products, it is only necessary to deduct the manufacturing cost of each kind of product from its market value to get the worth of the material alone, and to appraise the grades of material in proportion to these material values.

A COMPLICATED COST PROBLEM

The tannery problem is for many reasons the most complicated of all cost-finding studies. Its difficulties recur in other manufacturing lines to such an extent that their solutions are likely to be of interest to all accountants and business men having to do with manufacturing cost. Hides and leather, in fact, present an excellent typical case of materials of different values purchased at a flat price covering the lot. The hides are purchased from hide buyers or agents, who sell in lots of 1000. Each hide is rolled separately, hair side in, and securely tied with cord. It is impossible to get more than a rough idea of the general condition of the hides when received at the tannery, so that the buyer's control over the seller is limited to deduction from the purchase for any hides in particularly bad condition, and for foreign substances which have a tendency to get inside of rolled hides and help out on the weight of the shipment. The lot of hides is, therefore, put on the books at the amount of money paid for it, and by all accounting principles every pound of hide cost the same price as every other pound contained in the lot.

The tanning and finishing process is a long one, involving many different operations. From the time

the lot of hides is worked into the first process one to four months elapse before the last hide of the lot reaches the stock room as finished leather. If both of the two commercial tanning processes are worked in the tannery, the hides as soon as unhaired are sorted into lots for chrome and bark process respectively. The chrome process is complete in a day, but the bark process requires three weeks. The sides of leather come from the chrome process but little thicker than necessary for the finished leather, and when split to thickness leave a comparatively trifling "split" often only a few worthless shreds. The bark-tanned hides are much thicker, and when split to the desired gages, leave heavy splits, some of which are more than half the thickness of the tanned hide. The leather is sorted just before splitting by a skilled man able to select for each side of leather he handles, the thickness and character of finish which will give it the greatest market value. The sides of leather are finished by many successive operations bearing technical names, but substantially consisting of soaking in greases, rolling, stretching, scraping and coating with various compounds. When the sides finally reach the graders of finished leather they are sorted for the last time, according to the surface defects, texture and perfection of finish, into two or three grades of each style of finish. Not until this time can it be determined what market grade any given side of leather may produce.

In attempting to find the cost of the various kinds of leather the labor and indirect expense items present no particular difficulty. The operations on each style of leather can be listed, observed and timed, and the aggregate cost of the finishing process obtained in cents per square foot. The tanning and previous processes common to all styles of leather can be similarly reduced to definite costs. The trouble comes with the attempt to obtain the cost of material. Apparently each and every pound of hide in a given lot of 1000 has the same value, equal to the purchase price, say 10 cents per pound. But when the hide is divided edgewise into a "grain" and a "split" how shall the purchase price be divided between the more valuable and less valuable portions? The weight has also changed by this time for a pound of green hairy hide is not equivalent to a pound of tanned leather, so that scale weights will not tell how much hide went into the tanned sides.

DIFFICULTIES WITH FINAL VALUES

The several quality grades are determined largely by the surface defects of the sides. If the animal once collided with a barb-wire fence its hide may divide into a No. 1 side and a No. 3 side. A thousand hides may work out into 50 to 100 styles and grades of leather. With the price of various kinds of leather covering a range of 5 cents to 25 cents or more per square foot, no useful purpose is served by operating an expensive cost system, unless something can be produced which shall be more enlightening than cost figures based on the erroneous assumption that purchasing 5000 lb. of hides at 10 cents per lb. means that every pound of poor, damaged hide is worth just as much as a pound of fine quality hide. With a uniform valuation placed on every hide the cost of leather would range within a few cents, say from 14 to 16 cents for grades selling from 8 to 25 cents. The sales manager would have no way of finding out how much a rise of a cent in the price of a low grade leather would affect the margin above cost of the whole lot of hides; or whether in view of a rise in price on high grades he could afford to cut the price on low grades. For sales department guidance the total cost of a particular lot of hides must be divided between the hides used in each style and grade of leather, so that the sum of hide cost plus manufacturing cost of each style and grade will be in approximate proportion to the market price. A rise in price of one kind of leather will make the hides used in that kind more valuable, and correspondingly decrease the proportion of the total lot cost to be borne by the other hides in the lot. The problem, in the symbols of algebra, is $x + y = \text{constant}$. If x goes up, then y comes down. The lot of hides cost a known sum of money. If one selection of the lot is worth more than the average the other is worth proportionately less.

THE CALCULATION

The application of the method of appraising the several constituents of a material of mixed quality according to the market value of the products is as follows: The quantities and grades from a unit quantity or lot of material, the total cost of which is known, are priced at the market, prices extended and amounts totaled. The sum is the market value of the lot of manufactured products. From the value of each kind of product, subtract the manufacturing cost, obtained by usual cost-keeping methods. The difference in each case is the value of the raw material used in that item of product. The sum of these values gives the total value of the raw material. If there is a profit in the manufacturing operation, as is to be hoped and expected, the sum of the values of the raw material so calculated will be greater than the amount paid for the material. Suppose the calculated total is 180 per cent. of the actual purchase price of the material. If so, by dividing the value of each item of material by 1.80, the proportionate values at cost will be found, for the sum of these reduced values will equal the purchase price of the whole quantity of material. By adding together the calculated value and the manufacturing cost of each kind of product, the cost of each item will be ascertained.

Figured in this way, if the whole manufacturing operation shows a profit, the cost of each kind of product will show a margin of profit. A moderate change in the price of one or more kinds can be made without rendering the margin of profit on the whole list uncertain. A fortunate rise of price, making an increase of $500 in the market value of one item, can be measured in comparison with the cost of that item, and the amount of reduction in price which may be made on some other item can be quickly ascertained.

AN ILLUSTRATION FROM SHEET BRASS

For example, take the case of a factory buying from another works seconds, or irregular scrap pieces, of sheet brass at a flat rate of 16 cents per lb. Suppose that the material is sorted into large and small pieces, and from the larger pieces are made articles selling at a price list equivalent to 30 cents per lb. and costing to manufacture 3 cents per lb., and the small pieces are made into articles priced at the equivalent of 21 cents per lb., and costing to make 5 cents per lb. The scrap may be supposed to be salable at 8 cents per lb. If from a ton lot of material there are made 1000 lb. of goods for sale at 30 cents, 600 lb. of goods for sale at 21 cents and 400 lb. of scrap worth 8 cents, the market value of the lot is the sum of $300 and $126 and $32, or $458. The manufacturing cost of the lot is the sum of $30 and $30, or $60. The cost of the material was $320, so that the total cost of the lot is the sum of $320 and $60, or $380. The profit on selling for $458 goods costing $380 is $78, or 17 per cent. Figuring the cost of each kind of product separate-

ly, using the price of 16 cents per lb. for all the material, the first kind cost $190, the second $126 and the scrap $64, totaling correctly $380. On this basis the first kind sells at a profit of $110 on a selling price of $300, or 37 per cent. The second sells at exactly what it costs, and the scrap sells at a loss of 50 per cent. There is no way to tell whether it will pay to take a large order of the high-priced goods at 25 cents with an apparent profit of 24 per cent., except by first figuring the values of the other products. If there are a dozen different products instead of only two, the effect of a change in price can only be learned by much figuring. In the illustration given the sale of one of the two products without profit suggests that this product is not worth the trouble of manufacture and marketing.

FIGURING BACK TO MATERIAL COST

The rational way to work out the costs of this factory is by figuring back from selling price to material cost. To illustrate, let us figure the same profit on material and manufacturing cost of both the two lines of product. The manufacturing cost happens to be the same for each of the two lots of product—namely, $30. Allowing for its share of the 17 per cent. profit, the amount to deduct from selling price for manufacturing cost becomes $36.14. The material value of the first lot is found by subtracting $36.14 from $300, leaving $263.86. The material value of the second lot is found by subtracting $36.14 from $126, leaving $89.86. The scrap metal has no manufacturing cost and its material value, reckoned without profit, is $32. The total value of the material entering into the manufacturing operations is $263.86 plus $89.86, which is $353.72. The material cost $320, from which the amount realized from scrap is to be deducted, leaving $288 as the net cost. If now the amounts $263.86 and $89.86 are reduced in the ratio of $353.72 to $288, the results will be the actual values realized from the material used in manufacturing the two lots of product.

The first lot is thus found to have brought a valuation of $214.85. As there were 1000 lb. in the lot so graded, the value per pound is 21½ cents. The second lot brought a valuation of $73.15. This lot contained 600 lb. with a value per pound of 12.2 cents. The first lot cost for material and manufacturing 24½ cents per lb., and with a sale price of 30 cents realizes a profit of 18 per cent. The second lot cost a total of 17.2, and with a sale price of 21 cents realizes a profit of 18 per cent. The scrap remaining is valued at what it will bring, 8 cents, and is supposed to be handled without profit.

These prices are rational for the several classes of material. They will serve as guides to the purchase of selected lots of large or small pieces, if such should be in the market. Thus, a lot of large pieces only would be worth 21 or 22 cents per pound, while a lot of small pieces would be worth only 12 to 13 cents. If desired the calculation may provide for a larger profit on one kind of product, and the value of the material to be used will be changed proportionately. The method is flexible in its applicability to every operation where a material purchased at an average price is afterward graded into portions of varying values.

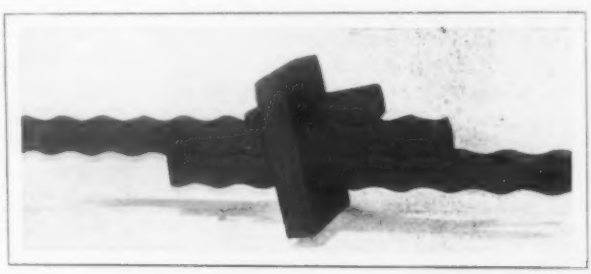
The Titanium Alloy Mfg. Company, Niagara Falls, N. Y., announces that it has organized a bronze department for the manufacture of titanium-bronze specialties under its various patents. William M. Corse, formerly works manager of the Lumen Bearing Company, Buffalo, and lately general manager of the Empire Smelting Company, Depew, N. Y., will be associated with the company as manager of the new department.

New Deformed Concrete Reinforcing Bar

A reinforcing bar of substantially uniform cross-section throughout is being made by the Cambria Steel Company, Johnstown, Pa. It is a rolled bar, as noted a few weeks ago in these columns, manufactured under patents granted to E. E. Slick, vice-president and general manager of the company. The bars, it is pointed out, are as satisfactory as the plain square type and have a special form of splicing device which decreases the amount of lap ordinarily required and consequently reduces the amount of material used to no advantage.

As will be noticed from the accompanying illustration, the projections on these bars are arranged in the form of waves and are located so that the concrete can be firmly bedded on all portions of the bar without air pockets forming that would destroy the contact. The bars are arranged so that their surfaces will interlock by merely placing them in contact with each other.

Tests were made in the manufacturer's laboratory to determine the strength of the clamps and the wedges. The bars tested, which were of structural steel composition, had a lap of five corrugations or approximately 5½ in. at the joint. It is stated that in every case the specimens broke in the body of the bars, the clamp and the wedge being intact after the bar ruptured. A ½-in. bar showed an ultimate tensile strength of 63,800 lb.



A Recently Developed Type of Reinforcing Bar for Concrete Work Which Is Deformed on Two Opposite Faces

per sq. in. and two ⅝-in. bars gave results of 58,640 and 59,690 lb., respectively. The stresses that were applied, it is pointed out, are approximately four times as great as those to which the bars will be subjected in actual use. The bars also were bare when tested, while in use they will be surrounded by solid concrete, which will, of course, add more strength to the splice. These bars are made in all of the standard sizes, from ¼ to 1¼ in. on a side.

A New Blast Furnace at Steelton, Pa.

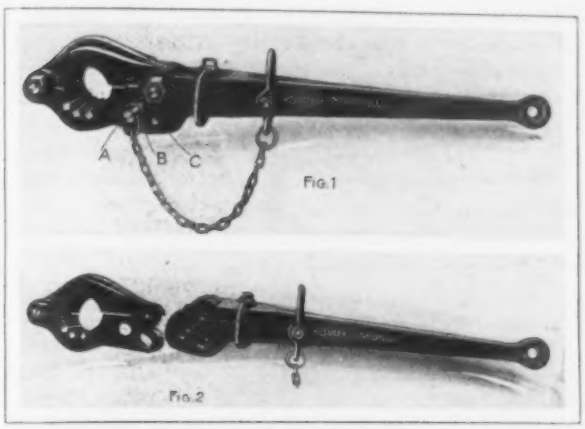
The Pennsylvania Steel Company has begun the erection of a fifth blast furnace at its plant at Steelton, Pa. The stack is to be of 500 tons daily capacity and to be located a short distance from Nos. 3 and 4 furnaces which were built in the eighties. It is estimated that the cost will be about $1,000,000.

Of the electrical production of pig iron the report of the Stora Kopparbergs Bergslags A.B. of Sweden for 1913 says: "This industry has been developing very satisfactorily and the experience now gained will most probably result in a decision to build new electric furnaces in the near future."

The Illinois Metals Company of Chicago, which manufactures tree sprayers, metal toys and novelties and steel cattle stanchions, has moved its plant to Plano, Ill.

Reversible Pipe Tong of Simple Design

The Southern Well Works Company, Chattanooga, Tenn., has brought out a universal pipe tong with a friction and die hold, which is reversible without removal from the pipe. It is made in heavy sizes for oil field work and in a lighter model for general purposes. The tong designed for heavy work has interchangeable jaws to fit pipe ranging from 3 to 28 in. outside diameter. Only one handle



Tongs Which May Be Reversed Without Removal From the Pipe

is required for all jaws. The general construction is shown in the accompanying illustrations, Fig. 1 showing the adjustment for screwing up a pipe with the pin *A* in the hole *B*, nearest to the center of the jaw. To reverse operations so as to unscrew the pipe it is only necessary to remove the pin from the hole *B* and insert it in hole *C*, farthest away from the center of the jaw. Fig. 2 illustrates the construction of the jaw in relation to the handle and the manner in which the reversing feature is obtained. In each jaw three dies are inserted to prevent slipping on wet or oily pipe. Where the tong is suspended from a derrick or crane for ready use the pipe can be approached from any angle, double clevises and double suspension hooks having been provided to that end. The fulcrum pin and jaw bolts are made of nickel steel, case hardened. The dies are of drawn tool steel and the jaws and handle of solid steel. For the reason that the jaws fit snugly around the pipe, making a gradual friction hold, it is stated that pipe cannot be bent or crushed with the new tong.

The Efficiency Society's September Meeting

The Efficiency Society, Inc., will hold its September convention at the Lake Placid Club, Lake Placid, N. Y. The convention will begin on Friday, September 18, and will continue until Monday, September 21. The general topic for the convention is Efficiency in Commercial Enterprises. The following topics will be discussed: Production, distribution, office management and cooperation between competitive industries.

The outline for the sessions is as follows: On Friday afternoon, production; Saturday morning, distribution; Saturday afternoon, office efficiency; Sunday, personal efficiency; Monday, cooperation among competitors. William R. Willcox, former chairman of the Public Service Commission, first district, New York, and president of the Efficiency Society, will deliver the first address at the convention.

New York members of the society plan to leave New York Thursday night, September 17, arriving at Lake Placid the next morning. Arrangements have been made with the railroads for the accommodation of members from Chicago, Buffalo, Cleveland, Cincinnati, Pittsburgh, Washington and Boston.

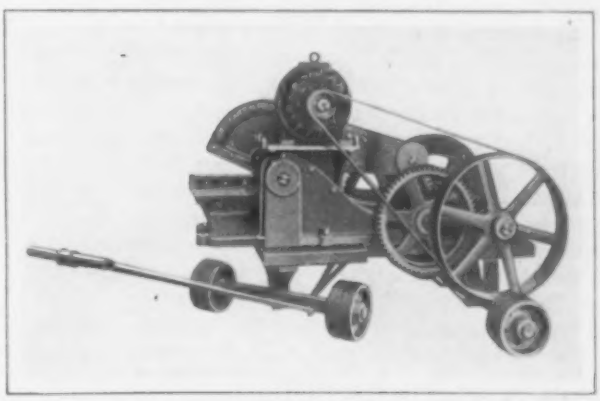
A Portable Alligator Shearing Machine

An improved design of portable alligator shearing machine has been brought out by the Canton Foundry & Machine Company, Canton, Ohio. The old type of motor-driven shearing machines, both stationary and portable, made by this company was belt driven from the motor pulley to the flywheel. In the new design a large driving pulley has been placed at the end of the pinion shaft where the flywheel was formerly located and the flywheel has been placed at the opposite end of the pinion shaft. It is claimed that with this arrangement a perfect balance is maintained, and as the power and strain are now applied equally on both sides of the machine the danger of the countershaft twisting and breaking is eliminated, torsional strain is done away with, the machine requires less power than it would were it not perfectly balanced, it runs truer and will last longer.

The motor is attached to the side of the machine on a bracket. Certain advantages are claimed for driving by a belt and pulley instead of the direct drive, among them that the machine takes less floor space, there is less noise, less wear on the motor and in case of an overload something would break on a direct-geared machine, but with a belt-driven machine the belt will slip on the pulley and the machine come to a standstill.

The trucks are strong and heavy in construction and have wide wheels, which make it easy to draw them over the ground. The front and rear axles are arranged so that the tongue or handle can be attached at either end. The trucks are extended only to the end of the housings so that scrap will not accumulate on the truck and get in the way and make it difficult to move the machine.

The machine is made in two sizes, the No. 1 having a capacity for cutting 1½-in. square soft steel or iron, the opening at the widest point being 6 in. and the knives 13 in. long. It is driven by a 3-hp. motor and weighs about 5000 lb. The No. 2



A Portable Shearing Machine of the Alligator Type Equipped with Motor Drive

machine has a capacity of 1¾-in. square steel, the opening is 7½ in. at the widest point and the knife is 18 in. long. It is driven by a 5-hp. motor and with truck and motor weighs about 9300 lb.

The Hero Mfg. Company, Kensington, Pa., manufacturer of drawn and stamped metal ware, has established an office in the Harrison Building, Fifteenth and Market streets, Philadelphia, which will have sole charge of selling the company's product and handling its advertising and kindred business.

The Rayfield Automobile Company expects to open its new plant at Tilton, Ill., within a month. The company is moving from Chrisman, Ill.

Finishing Temperatures in Rolling Rails

Measurements by the Bureau of Standards in Four American Mills Show Them to Be High—The Shrinkage Clause in Specifications

The Bureau of Standards of the Department of Commerce has completed a report upon a series of observations of finishing temperatures and properties of steel rails by G. K. Burgess, J. J. Crowe, H. S. Rawdon, and R. G. Waltenberg of the Bureau staff. The main objects of this investigation were to determine from measurements taken in representative rail mills, the present American practice regarding the temperatures at which rails are rolled, to demonstrate the ease and accuracy with which such temperatures may be measured, to find out what the "shrinkage clause" in rail specifications really means, and finally to determine for rail steels some of the physical properties, particularly those of interest in manufacture, some of which, it would seem, are not sufficiently well known as yet. Among these last are the expansion, melting ranges, critical ranges and temperature distribution throughout a rail section on cooling. The main points in the report follow:

FINISHING TEMPERATURES AN IMPORTANT FACTOR

It is generally recognized that the factor of greatest importance in the manufacture of rails is the making of sound ingots. But it is also acknowledged that, starting with sound ingots in the rolling mill, the quality of the rails produced will depend in a very considerable measure on the process of rolling, and in particular on the temperatures. The undesirable effects of rolling too cold and too hot were very early recognized, but there is not complete agreement or conclusive evidence regarding the effects of finishing rails too hot.

The usual argument, briefly stated, is as follows: Rolling steel below the critical range distorts and weakens the crystalline structure, while rolling and finishing at temperatures too high above the critical range produces a coarsely grained steel which is weaker than the finer grained structure obtained by doing work continuously on the rail down to the critical range, which usually lies between 650 and 750 deg. C. (or 1200 to 1400 deg. F.) for rail steels, and is rarely above 700 deg. C. (1300 deg. F.).

The manufacturer prefers to roll his rails hot, as less power is then required to operate the mill and there is less wear and tear of the rolls so that, in practice, fixing a lower temperature limit is of relatively less importance, although the results of too cold or uneven rolling should not be overlooked in framing specifications.

It appears to be the general opinion that with the high carbon rails of heavy section, with their greater tendency to brittleness, now so generally manufactured, the necessity of more closely limiting the upper temperature of rolling is of greater importance than with the lower carbon rails of a few years ago. Nevertheless, an examination of the specifications generally in use for the purchase of rails in this country, will show that there has been a tendency to raise rather than lower the allowable upper limit of finishing temperatures as defined by rail shrinkage, and the question arises whether this specification should not now be subject to revision, both as to its numerical value and as to the manner of its measurement. More experimental work will also have to be done before satisfactory specifications can be drawn as to finishing temperatures, and it would be highly desirable if one or more of the mills could make a series of a considerable number of rails, (several thousand at least) as similar in all other respects as possible but each series rolled at a definite well determined temperature. This would not be difficult of accomplishment and a record of their behavior in the track could easily be kept.

TEMPERATURE MEASUREMENTS AT FOUR MILLS

In pursuance of this investigation a series of measurements of ingot and finishing temperatures were made at four representative rail mills, designated by A B C and D. The portable pyrometer used was the Holborn-Kurlbaum type of the Morse instrument. Temperature observations were taken by sighting on the rail bars at the instant of cutting by the hot saws, the pyrometer being located so as to view the head of the rails at the first saw, except for mill C, at which, for convenience, the base of the rails was sighted as they passed to No. 1 bed. Since mill C was rolling a rail of heavy base, the measurements are comparable with those made by sighting on the heads. This was also controlled by direct observation.

The only considerable element of non-uniformity of the measurements at the several mills lies in the fact that the distance and time from the finishing pass to the hot-saws is not the same for the several mills. This time for mill D is about half that for mills A, B and C, while the ratio of distances is roughly: A=4, B=5, C=3 and D=1 for the positions at which temperature measurements were taken. Two of the mills, A and B, used one saw and the others four saws. For the former it was possible to measure the temperature of practically every rail, while for mills C and D the average temperature of the rail bar as it passed to the cut (for mill D, and after cutting for mill C) was measured. In mills A and B the blooms were not reheated and in C and D they were reheated before rolling into rails.

Measurements were also made, at each mill, of a series of ingot temperatures, observations being taken as the ingot entered the blooming mill and for each alternate pass. It was possible in some cases to take observations on rail bars from ingots the rolling temperatures of which have also been measured. Auxiliary temperature measurements were also made at mill A, including observations at the bloom shears, open-hearth, Bessemer and blast furnaces, before and during tapping, pouring into ingot molds, and the temperature of ingots at stripping and removing from soaking pits. All observations were taken without any interference with the regular operation of the mills, and no special arrangements or installations were found necessary for manipulating the pyrometer apparatus.

UNIFORMLY HIGH TEMPERATURE AT FOUR MILLS

An inspection of the data shows a practical uniformity among the several mills for the rolling

temperatures of ingots for steel rails, the range being from 1080 deg. C. (1975 deg. F.) to 1140 deg. C. (2085 deg. F.). With the exception of the Bessemers of mill D, rolled at an average temperature of 1047 deg. C. (1917 deg. F.), there is no very considerable difference among the finishing temperatures of the rails as observed at the hot saws for the several mills, the range being about 880 deg. C. (1615 deg. F.) to 990 deg. C. (1815 deg. F.). Or, in other words, the four mills all finished their rails to within 50 deg. C. of 935 deg. C. (1715 deg. F.) on the average, excepting the Bessemers of mill D. This temperature of 935 deg. C. is 270 deg. C. (520 deg. F.) above the mean value, 665 deg. C. (1230 deg. F.) of the critical ranges of these rail steels.

As to the distribution of temperatures within the head of a cooling rail, the center of the head is some 50 deg. C. (120 deg. F.) to 60 deg. C. hotter than the optical pyrometer reading at 935 deg. C., therefore, the center of the head is finished, on the average, at about 325 deg. C. (615 deg. F.) above the critical range for 100-lb. sections.

The data on finishing temperatures show several other facts of interest. For example, it is evident that it is a possible and easy operation to determine accurately the temperature of each rail length in succession as it arrives at the hot saw. From the measurements at mill A, the relative temperatures of rails differing in weight of section, rolled from ingots having closely the same weights and temperatures, are shown. Thus the average of the finishing temperatures of the top rails (A and D or A and C) from 100, 90 and 75-lb. sections were respectively, 988 deg., 976 deg., and 924 deg. C., and similarly for the others.

Chemical analyses and photomicrographic examinations were also made and the mechanical properties determined for a number of samples of rail the rolling of which had been observed. From a comparison of these not very numerous observations, there appears to be not a sufficient degree of correlation to warrant associating very specifically any of the characteristics defined by these three methods of examination, either with the temperatures of rolling here observed or with each other.

SHRINKAGE CLAUSE IN SPECIFICATIONS

The history of the "shrinkage clause" in American rail specifications was carefully reviewed during the investigation. The American Society for Testing Materials in 1909 limited the shrinkage allowance on 100-lb. sections to 6¾ in. in 33 ft., or to an equivalent of 1947 deg. F. (1064 deg. C.) for open-hearth and 2055 deg. F. (1124 deg. C.) for Bessemer rails. This specification is still in force. The practice of the rail mills regarding the actual shrinkage used, as given by Selew in 1913, shows a minimum shrinkage allowance for rails of 100-lb. section of 5⅝ in. (1705 deg. F. for open-hearth) and a maximum of 6¾ in.(1947 deg. F. for Bessemer), most of the mills using a shrinkage of 6⅝ in. or over, corresponding to finishing temperatures of 1920 deg. F. or over for open-hearth rails.

As would be expected from the nature of the process of rolling, starting with blooms of a given weight and section, the rails of heavy section are generally finished at a higher temperature than those of light section, although this is not the practice for all mills. This is recognized in most specifications by allowing a shrinkage of "⅛ in. less for each 10-lb. decrease in section" (from say the 100-lb. section). This clause is equivalent to finishing 80-lb. rails at 50 deg. F. lower temperatures than 100-lb. rails.

If it be considered desirable to finish rails of all sections at the same temperature, this could readily be accomplished in practice by starting with ingots (in a continuous mill) or with blooms (in a mill with reheated blooms) the temperatures of which have been adjusted before rolling into rails. On the whole, it would seem more logical, if the best possible product is desired, to finish the rails of heavy section at a lower temperature than those of light sections. It should perhaps be again emphasized at this point that it is not difficult to control rolling temperatures pyrometrically.

SHRINKAGE CLAUSE AND FINISHING TEMPERATURES

Concerning the shrinkage clause, it is apparent that an intelligent effort was made about 1901 to limit excessive rolling temperatures by endeavoring to define the maximum finishing temperature at about 1600 to 1750 deg. F., but the methods of measuring temperatures then in vogue did not permit a suitable pyrometric control, so that recourse was had to the shrinkage of the rail at the hot saw to define the finishing temperature, although no account was then or has been since taken of the different contractions for various steels.

It would seem, moreover, that the value then generally assigned to the shrinkage (say from 1904) did not give an exact idea of the finishing temperature, and this shrinkage allowance, as finally adopted, is unduly high, due in part to pressure from the manufacturers. It will also be recalled that the present rolling practice in four representative mills is on the average some 500 deg. F. or more above the recalescence region but well within the shrinkage specifications. The maximum finishing temperature allowed by the American Society for Testing Materials, 2055 deg. F. (1124 deg. C), is above the temperature of rolling of many ingots for rails.

The consensus of opinion is to the effect that rails should not be finished too high above their critical region. Nevertheless many are actually finished at very much higher temperatures, and this under a clause in specifications originally drawn with the purpose to limit the maximum allowable finishing temperature to slightly above the critical range. It would appear therefore that the present "shrinkage clause" of such specifications as those of the American Society for Testing Materials, for example, has no significance whatever.

In conclusion, it should be emphasized that the various series of observations recorded in this investigation are of but a preliminary nature and do not pretend to solve the question of the relations between temperature of rolling and the properties of rails. It would seem desirable to make a much more complete and comprehensive study of the various matters mentioned and of related questions than has hitherto been attempted, and on a scale commensurate with the importance to the community of the problem of sound rails.

The Linde Air Products Company, Forty-second Street Building, New York, has added to its list of oxygen distributing stations the following: Davenport, Iowa, 118 Harrison street; Los Angeles, Cal., 514-518 Moline street; Minneapolis, Minn., 324 North First street. In addition to these stations a new plant at North Kansas City, Mo., is now in operation, producing oxygen for the Middle West territory. The company now has 26 distributing stations throughout the country, where a supply of oxygen is kept on hand for immediate shipment, and new stations will be established in the various industrial centers as fast as the demand warrants it.

Minimizing Cost of Special Tool Work

Two General Methods of Machining Work Which Obtain—Why One Has Resulted in Lower Manufacturing Costs

BY ALBERT A. DOWD

"Special tools cost a lot of money" is a maxim which has considerable weight with the manufacturer of the present day, although when taken in conjunction with the ultimate production secured by their use it does not appear so formidable. It is worthy of note, however, that when several bids on special equipment are being considered, it is usually the lowest of these that gets the contract, other conditions being equally favorable. Yet when the tools are received and looked over, it nearly always seems as if their cost was at least double what it should be, so that the user feels as if he had been charged an excessive price.

Now, the cost of an equipment may appear to be very high to the buyer, when compared with the value and cost of tools made in his own factory, yet in reality the price may be very moderate when all things are considered. On the other hand the cost may really be exorbitant on account of the way in which the machinery has been produced. In either case it should be remembered that there are a number of things which enter into and affect the cost of special tools, which do not appear on the surface. For instance:—cost of designing and cost of special patterns.

In the first place, the design itself affects the cost and should therefore be made as simple as consistent with the work in question, both as regards pattern work and machining, for it is obvious that elaborate design and expensive patterns add very greatly to the ultimate cost. In the second place, the method of handling the work and the shop equipment with which it is produced are important factors in the cost.

THE TWO METHODS OUTLINED

In the past ten years I have been connected with factories in which work of this character is handled by two different methods and have therefore had an opportunity to judge their merits and their effect on the final cost of the work. In brief the two methods were as follows: In the first instance, special tools and fixtures were routed through the various shop departments, the various parts eventually coming to the toolroom for the final assembling and fitting. This method was applied to practically everything except jigs, the bodies of which were planed or milled in departments devoted to this class of work and sent to the toolroom for the rest of the work, locating the bushings, etc. The equipment in the toolroom was such that a great deal of difficulty was experienced in turning out accurate work on account of the condition of the machine tools and their antiquity.

In the other instance the work was handled in an entirely different manner, as the toolroom itself was well equipped with machines which were well kept up and provided with all the modern improvements to facilitate the rapid production of accurate toolwork. Practically all of the work except the planing of exceptionally heavy pieces was accomplished in this one room.

In the first instance the work was done on a day work basis and in the second on the premium or piece work system. The cost of production was about 50 per cent. greater in the first instance than in the second, yet the quality of the work in the second instance was much superior to the first mentioned. As a natural consequence, in competitive sales of special equipment, the manufacturer using the first method was greatly handicapped by the prices he was obliged to charge for his finished work, so that the second man had this point in his favor as an entering wedge, which was largely influential in turning the contract in his direction.

It may be urged that in the first instance the manufacturer must have been blind to his own interests in not realizing the state of affairs and applying a remedy. As a matter of fact the company's salesmen frequently brought up the matter, because they were unable to see why the cost of equipment should be so much higher than their competitors for tools to machine the same pieces of work. The only argument which could be brought forth was that the other man must make his tools and sell them without a profit for the sake of selling a machine. It was pointed out to the salesmen that work was routed through the factory so that the advantages incident to special operators on milling machines, planers, etc., could be taken advantage of, thus making labor costs very reasonable. It seemed a natural supposition that work could be handled to better advantage when routed through departments specializing on the particular operation required, as very little lost time would be necessary in changing from one piece of work to another, while tools needed would be ready to hand.

This argument looks all right on its face, but a more careful examination reveals a few weak points. In the first place, when this method of handling the work is used, there are several men through whose hands the piece must pass, and each of these must study the blue print sufficiently to be sure of a thorough understanding, before any machining is attempted. Then there is the loss of time incident to changing from one job to another, and it is certain that any delays will be charged against the special tool rather than the regular work. The actual operations on the tool may be more quickly done than if one man were to do the work using several machines in the process, but the accumulation of losses in setting up and preparation by the various operators will be likely to cause an increase rather than a diminution of cost, even though the workmen's respective rates are cheaper than the toolmakers. In addition to this there are many more chances for errors in machining when the work is done by a number of different men, and this entails extra work in the final fitting and assembling. It is also difficult to impress upon a man accustomed to general manufacturing work, the importance of extreme accuracy often required in special tool work.

ONE CASE ILLUSTRATED

I remember an instance of this kind which will serve to illustrate the point to advantage. There was a special tool block to be made (as a part of an equipment), in which there were five narrow parting tools spaced 1.125 in. apart, permissible limits

of variation in spacing being 0.002 in. over and 0.000 under the dimensions given. The importance of the spacing was clearly explained to the foreman of the milling department, and the figures on the blue print were very definite. The steel block was first milled to shape and the slots cut, after which it was sent to the toolroom for the final fitting and assembling. An inspection was made by the toolmaker to see if slot spacing was correct, and it was found that no two were alike and that there was a difference of 1-64 in. between the greatest space and the smallest so that it was out of the question to attempt to rectify it. The matter was taken up with the milling machine foreman who said he would have another block made and would oversee the work himself. An inspection of the second piece showed a great improvement, but it was not quite within the required limits of accuracy, so that the toolmaker was obliged to use the shaper to rectify it, by planing out the slots a trifle larger to obtain the correct spacing. The five parting tools which had been carefully made to the sizes called for on the drawing were set aside for use in the toolroom, and another set made to fit the altered slots in the block.

Granting that this is an exceptional case due to poor workmanship and improper supervision, it is only one of numerous cases which are continually arising under this system of handling special tools. Invariably the amount of work in assembling and fitting, which the toolmaker is obliged to do, is far greater than it should be.

MINIMIZING COSTS BY SPECIALIZATION

The second method of handling special work involves a number of points, each one of which is of assistance in producing work of this character at a minimum expenditure. The toolroom itself is well lighted and clean, and is well equipped with up-to-date machines, such as lathes, both bench and engine types, universal milling machines, planers of small size, shaping, slotting, horizontal boring and die sinking machines and drilling machines, both of the sensitive type and the heavier variety. Lathes naturally predominate, but there are enough of the other machines so that work is seldom held up for want of a machine. A number of the men are specialists on certain machines, such as planer, shaper, lathe and milling machine, and some are exceptionally good on several machines. There are also several of the men who specialize on cutting tools such as mills, reamers, etc. In addition to these men are the regular tool makers who take care of the jig and fixture work. Each group of specialists is under a "gang-boss" or "under foreman," who in turn is responsible to the head of the department.

The methods by which the work is produced are as follows: The prices allotted for the tools are based on the original estimate on which the contract was secured, and are given to the head of the department who pieces it out among the men according to their specialties, giving each "gang-boss" the necessary instructions regarding accuracy, with the allowed price and the number of hours. Work in process goes from one gang boss to the other as it is completed, and the final assembling is done by a fitter or a toolmaker, depending on the class of work represented.

The men throughout the department work in harmony with each other and all have an extra incentive in the possibility of making additional money. The man in the tool crib is also a valued factor in the department, for his wages are considerably above the ordinary and he is impressed with the necessity of keeping the tools in good condition so that no loss of time in the department is occasioned by the necessity of putting tools in shape as they are drawn from the crib.

In jig and fixture work the planing is done by one of the men employed on this class of work, but it is under the instruction of the toolmaker who is to complete the work, so that there is never any doubt about the important points and locating surfaces when it is turned over to the toolmaker. A small hand screw machine is operated by a boy from time to time and used to make up bushings and other small parts which are required, when a number of any one kind can be produced more economically in this way.

In comparing the two methods of manufacture it will be noted that there are a number of points of similarity, for both methods make use of specialization in order to obtain results. In the first method, however, the work is not under the immediate control of the tool department except in its final stages nor are the workmen all trained to the finer classes of work such as are required in special tool work. The toolroom equipment also is far below the standard and there is no incentive to produce the work rapidly. In the second case, everything is favorable for a high grade of work; large, well-lighted room, and toolroom equipment of an unsurpassed nature, together with an assembly of men familiar with accurate work, and under one head who controls the entire situation. The chance to add somewhat to the regular wage by the exercise of care and rapid work adds largely to the success of the second method.

The results obtained in this way are ample proof of its economy as the writer has seen very conclusively proved, a higher grade product being secured at a much lower cost and in much less time than is required by the first mentioned method.

National Carbon Company's Profit-Sharing Plan

The National Carbon Company, Cleveland, Ohio, maker of electric light carbons, batteries and other electrical equipment, has adopted a profit-sharing plan which will be in the form of a stock distribution and bonus payments among its factory and office employees and salesmen. A common stock allotment of $500,000 will be used for this purpose. Employees will be allowed to subscribe at par for the stock, the market value of which is said to be about $118 a share. Payments for the stock can extend over five years and payments may be as small as $1 a share per month.

Employees earning $500 a year or less are entitled to subscribe for one share; those earning from $500 to $1000 can subscribe for two shares, and those earning between $1000 and $1500 a year can take three shares. Subscriptions must be paid in not more than five years nor less than three years. No subscriber shall pay more than one-third of his total subscription in any one year and the payments must average per month at least 1 per cent. of the total subscription. Dividends, which are at present 6 per cent., will be credited to the subscriber and he will be charged interest at the rate of 4 per cent. a year on unpaid subscriptions. A bonus of $5 a share for each share subscribed for will be credited to the subscriber in each of the five successive years. To an employee whose stock has been fully paid for in less than five years the bonus will be paid in cash each year for five years if he has been continuously in the company's employ. Voting power does not go with the stock until it is fully paid up. If a subscriber leaves the company's employ or cancels his subscription before it is fully paid, the company may with his option close the account and return to him the full amount he has paid in with interest. Provision is made for protecting the rights of the employee or of his estate in case of permanent injury or death.

LATE STEAM TURBINES*

Large Units with Impulse Elements for High Pressure—Remainder Reaction Elements

In the impulse type of turbine, the impulse element comprises a nozzle in which the steam is expanded to the exhaust pressure of that element. There is a complete energy transformation within the nozzle transforming the potential energy due to pressure into kinetic energy. This nozzle is followed by certain rows of blading. If the blades may be operated with about 40 per cent. of the velocity of the steam, one row will economically absorb this velocity and we have the well-known Rateau or De Laval type of turbine. If the blade velocity must be materially less than this, it is customary to employ more rows of blades, the steam leaving the first moving row being redirected by means of guide vanes to a second row of moving blades. The highest efficiency obtained with this combination is where the blade velocity is about 22 per cent. of the steam velocity. With higher steam speeds and lower blade speeds, three rows of moving blades may be employed per element when the highest efficiency will be obtained with this ratio about 13 per cent. The above is approximately correct with blade speeds of 300 to 500 ft. per second.

The highest efficiency, which may under favorable conditions reach 80 per cent., however, is obtained with a single row of blades. By using the higher pressure range in the nozzle or lower blade speed, or both, thus necessitating the greater number of velocity elements, the efficiency falls off quite rapidly, so that a three-row velocity stage element is now only used in very extreme cases, such as in the reversing elements of marine turbines. Their efficiency will hardly exceed 50 per cent. The efficiency of the two-row element may be 65 or 70 per cent.

The efficiency of the nozzle itself is of a high order, particularly with small pressure drops, approximating 95 per cent., for 8 to 10 B.t.u., falling off to about 82 per cent. for a 200 B.t.u. drop.

In the reaction turbine, which it should be understood technically comprises a series of stationary and revolving nozzles and not blades, the following losses are involved:

1. Hydraulic losses, which depend on the blade angles, and the ratio of the steam velocity to the blade velocity. This velocity ratio varies from 50 per cent. in the small to 75 per cent. in large units, the hydraulic losses for the above ratios being from 22 to 10 per cent. respectively.

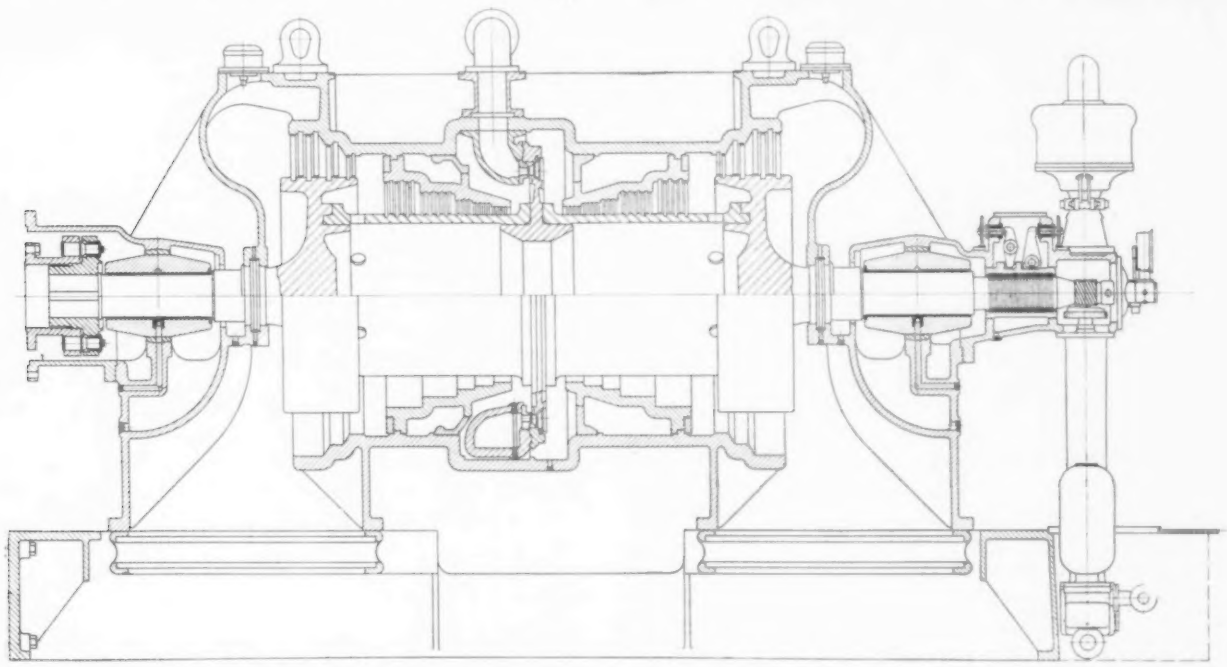
2. Nozzle losses—as in the case of the impulse turbine these are low. But particularly so in the case of the reaction turbine, because of the many stages and the small B.t.u. drop per stage.

3. Leakage losses—in a reaction turbine, these form a most serious item, and where the steam volumes are small, such losses may amount to 20 per cent. But in the combination type turbines herein described, where reaction elements are employed for the low pressure portions, the losses become inconsiderable, ranging as low as 5 per cent.

4. Skin friction, and the losses previously referred to in the case of the impulse element under items 2, 3 and 4, are exceedingly low inasmuch as the whole of the annulus between the outer diameter of the drum and the cylinder wall is completely occupied with the flow of steam and it is not subjected to the disturbances at the ends of the groups of jets, as mentioned in the case of the impulse elements.

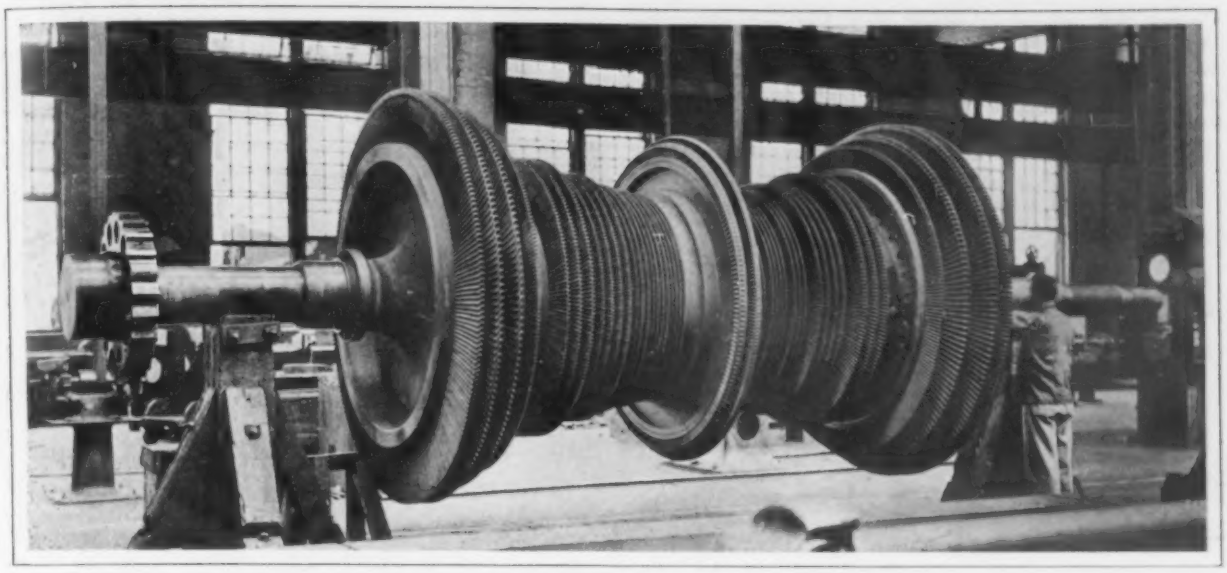
It is evident therefore, that higher economy is to be obtained from reaction elements providing the speed of the turbine and the volumes of steam are appropriate for design with low leakage ratios, and conversely, the impulse element is better for the high pressure end of a turbine where the volumes of steam are small.

In 1913, a number of contracts were taken for machines ranging in capacity from 15,000 kw. maximum to 22,000 kw. maximum. Those for 25-cycle service operated at 1500 r.p.m., while the 60-cycle, 15,000 kw. maximum rated units ran at 1800 r.p.m. In all these cases the complete expansion was carried out within a single cylinder. They represent the latest design of machines of large capacity at the given speeds designed for 29-in. vacuum



Longitudinal Section through Large Capacity Steam Turbine, Showing the Impulse Element through Which the Steam Passes Before Reaching the Reaction Elements

*From a monumental paper on "Recent Progress in the Building of Large Steam Turbines," presented by Francis Hodgkinson, engineer, Westinghouse Machine Company, to the American Iron and Steel Institute, New York, May 22.



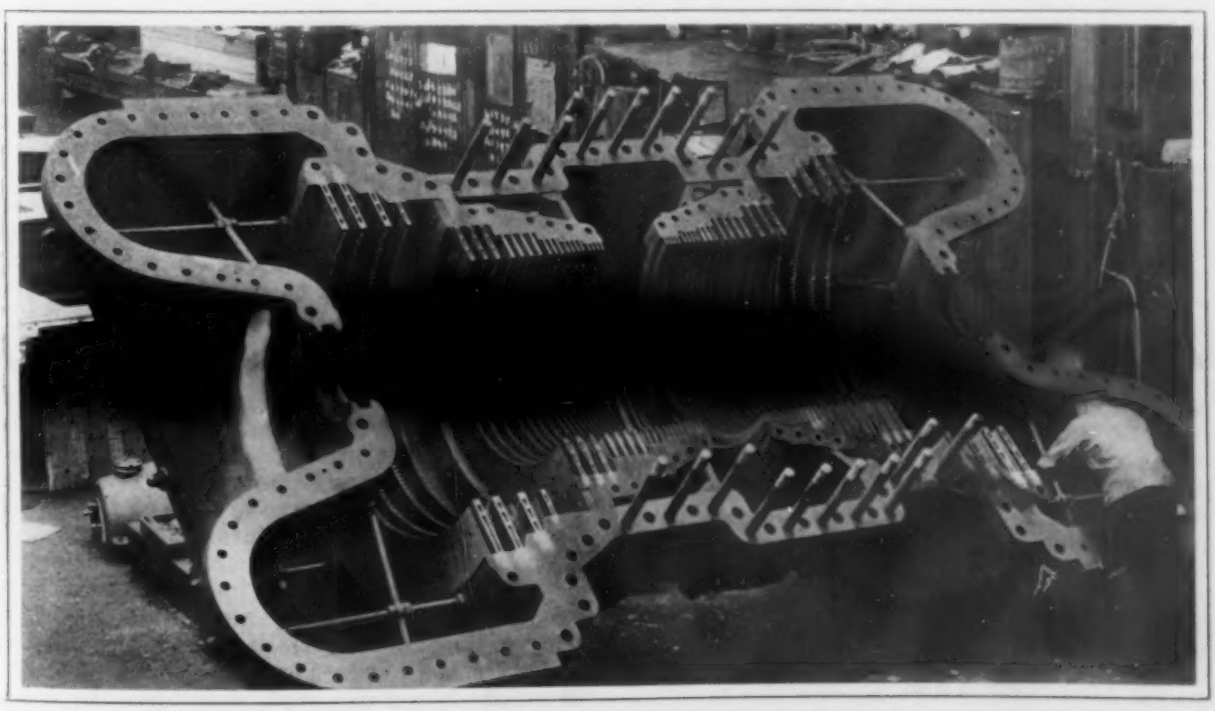
An External View of the Finished Turbine Spindle

The accompanying drawing is a longitudinal section through the machine, the steam passing single flow through the impulse element which operates at 400 to 450 ft. per second, expanding the steam to approximately 70 lb. absolute, then passing through the reaction elements double flow. Because of the large capacities of these machines, the blading of the low pressure end runs at higher speed than had heretofore been customary, viz., 500 ft. per second.

The construction of the disk carrying these blades is original in the respect that it is forged or cast in one piece with the spindle end and partakes of the nature of a solid disk without any perforations. With this construction, the stresses are comparatively low permitting with entire safety, the use of ordinary steel forgings and occasionally, castings of low grade nickel steel.

The construction of the spindle is apparent, the strong central drum giving great rigidity, and a calculated deflection of 0.007-in. An external view of the finished spindle is here given.

Every step has been taken to maintain the cylinder structure of simple form, with few changes of diameter, and with no feet or unnecessary excrescences. Tending toward this simplification, it should be noted that only the last few rows of blades are carried in the cylinder proper. The intermediate blade carrying element is entirely separate from the cylinder, this eliminating all flanges and ribs which would be involved should these blades be in the main cylinder. The blade-carrying rings may be seen in place in a cylinder cover in the second reproduction of a photograph. The method of securing these blade-carrying rings to the cylinder is merely to clamp them to a machined shoulder in the inner wall of the cylinder proper. These blade-carrying rings form complete cylinders in themselves, and are bolted together with studs and long nuts, which reach through apertures in the cover so that in assembling or disassembling, the respective halves of the blade-carrying rings remain in place as though they were cast there. While this construction has been employed primarily to bring about simplification of the cylinder, the advantage of being able to replace



The Blade Carrying Rings in Place in the Cylinder Cover

readily any or all of these blade-carrying elements is obvious.

On account of the high vacuum for which these machines are designed, the exhaust chambers are of necessity very large, and obviously on account of the external pressure, there must ample rigidity. This, of course, might readily be obtained by employing ribs and braces, and the like cast therein. However, for the sake of avoiding internal strains incidental to such construction, ribs are entirely avoided, and steel stays and braces employed.

Modern American Blast Furnace Practice*

Problems of Construction Affecting Uniform Practice and Highest Economy—The Development of Furnace Lines and Their Preservation

BY HERMANN H. BRASSERT†

The manufacturer who, in the swift march of progress and in the pursuit of an industry, the foundation of which is ever changing with altering raw materials, does not constantly take stock of his equipment and rejuvenate it to suit the times, will soon find himself outclassed by his competitors. Every improvement should be inspired by one common aim, and that is to facilitate the utmost uniformity of practice in order to gain the highest quality of product and the greatest possible economy.

STOCKING AND CHARGING APPARATUS

For the sake of uniformity and to eliminate the danger of mixing various grades and the necessity of frequent burden changes, adequate space and equipment for the stocking of ores should be provided. If a cargo can be spread evenly over a large pile, so that any cross-section of it represents a true average of all cargoes received during a shipping season, the furnace will receive the ores in the most uniform shape.

The bins should be so designed that the ore can be easily withdrawn under perfect control on the part of the operator. With sufficient slope and closely spaced gates to prevent the sticking of the ores in the corners, proper movement of the entire contents can be secured.

In handling the coke, the main object should be to avoid abrasion. That charging system is preferable which transfers the coke from the ovens or railroad cars into the furnace with the least number of drops. The coke can be charged by volume or by weight. Where the coke is uniform in moisture and furnace value, the weighing method will give excellent results. The coke pockets should be made of ample capacity to avoid delays, and should be designed to keep all of the contents in motion and to avoid the accumulation of fines—a most frequent cause of furnace troubles. The dust should be eliminated by screens placed in the bin or at the gates.

The charging or larry car should preferably be large enough to hold a full charge of ore and stone. This saves labor and wear by decreasing the number of trips, and allows the furnace to be kept full with the least effort, even when driving fast, at the same time rendering the percentage of error in weighing smaller.

The skip hoist can be either of the single or the double type. The latter has the advantage of filling the furnace faster, but brings with it the difficulty of obtaining an even distribution between the right and left side of the furnace, which must be overcome by proper construction of the top. The single skip allows the use of a cylindrical bucket with bottom discharge, dumping centrally over the bell and giving a correct distribution on the top of the furnace. But with that design it is necessary to correct the distribution in the bucket itself with regard to coarse and fine materials. This is a difficult matter and can only be accomplished by rotating the buckets. This type of hoist, however, has the decided advantage of more carefully handling the coke charges, and for that reason has been largely adopted in Europe.

TOP CONSTRUCTION AND STOCK DISTRIBUTION

The blast furnace top itself has been the subject of more variations in design that any part of the furnace. Besides being a gas seal, it has to fulfil the important function of proper stock distribution. It is difficult to accomplish this with a stationary top, and many furnace men prefer to abandon it in favor of rotating mechanical tops. If a good distribution can be obtained without resorting to the complication of rotary mechanism, all the better. If deemed necessary to employ a rotating top, such a design should be selected which will give a satisfactory distribution, even if it should cease to rotate.

Many of the irregularities of stock distribution bear no relation to the design of the top. Neither can irregularities of charging—such as are caused by lack of care on the part of operator, severe weather, and many other causes—be corrected by any design of top. It will be seen, therefore, that a rotating top is by no means the cure of all evils. Careful supervision, constant vigilance, a regular and frequent inspection, are the only safeguards and should be practiced regardless of the type of top in use.

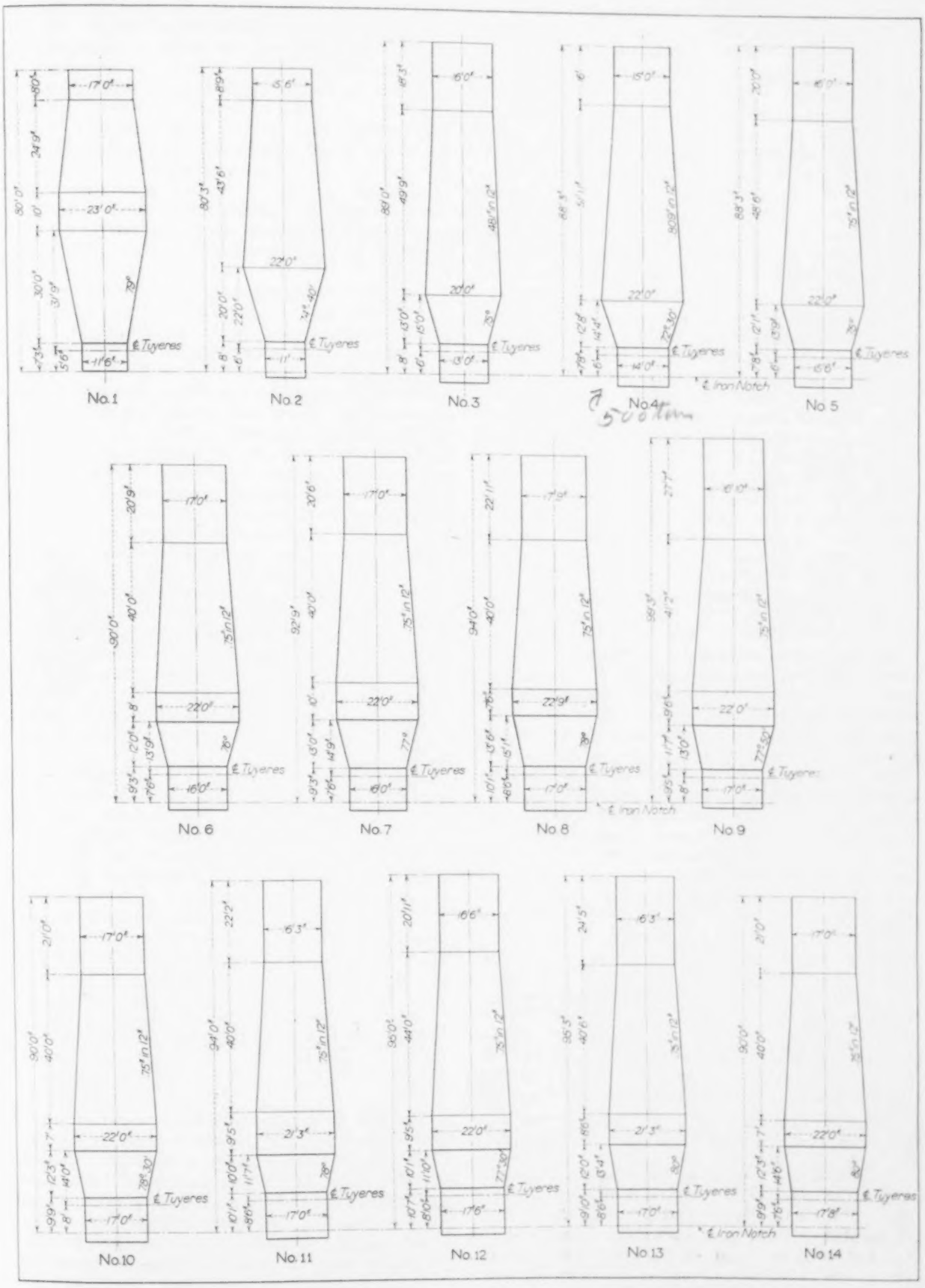
With a uniform distribution on the big bell, the next question is how the charges should best be arranged in the stock column. There are two opposite methods of depositing the materials in the furnace. The one, which is used abroad, but not in this country, consists in raising a cylindrical bell and allowing the charge to glide off the hopper towards the center of the furnace, there forming a cone with an apex of fines and a base of coarse materials. which gives the gases a tendency to ascend next to the walls. This is counteracted by using a comparatively small hearth with tuyeres projecting far in, or a central gas off-take, and frequently by special stock deflectors. In European practice the stock column is much more open,

*Second portion of a paper presented at the New York meeting of the American Iron and Steel Institute, May 22. The first portion appeared in *The Iron Age*, June 25.

†Superintendent of blast furnaces, Illinois Steel Company, South Chicago, Ill.

less fines and considerable lump ores still being used with large sized coke and stone. Under these conditions this charging method seems to give satisfaction; and in many places it is still adhered to, in spite of the great complication of design, especially when combining the central gas off-take with a mechanical top.

Under our conditions, using practically none but



No. 1—Edgar Thomson Furnace "D," 1882.
No. 2—Edgar Thomson Furnace "F," 1889.
No. 3—Edgar Thomson Furnace "H," 1894.
No. 4—Edgar Thomson Furnace "E," 1900.
No. 5—Edgar Thomson Furnace "K," 1902.
No. 6—South Works Furnace "E," 1905.
No. 7—South Works Furnace 10, 1906.
No. 8—South Works Furnace 7, 1908.
No. 9—South Works Furnace 9, 1909.
No. 10—South Works Furnace 3, 1909.
No. 11—South Works Furnace 5, 1911.
No. 12—South Works Furnace 10, 1912.
No. 13—South Works Furnace 8, 1913.
No. 14—South Works Furnace 4, 1914.

FIGS. 1 TO 14—DEVELOPMENT OF BLAST FURNACE LINES FROM 1882 TO THE PRESENT TIME

fine ores, in order to obtain uniform practice, the principal aim must be to prevent the channeling of gases. As it is their natural tendency to follow the walls where the stock is continually loosened by friction, we deposit the ores next to the wall, thus forcing the gases to the center. In order to accomplish this we use a method opposite to the one described, lowering a large conical bell and dumping the charges against the furnace wall, the finer materials remaining there on a higher ridge, the coarser ones rebounding and rolling toward the center. This opens up the stock column in the center and serves the same purpose as a central gas offtake, only in a milder form. A recent experiment made at South Works with a central tube, showed conclusively that this arrangement is too radical for Mesaba ores.

For the opposite purpose, that of loosening the stock next to the wall, various modifications of the plain bell have been tried. Such attempts originated in the early days of Mesaba practice, when it was thought that the formation of scaffolds could be avoided by placing less fines next to the wall. Designs of this kind have mostly been abandoned, as it was soon found that the evil of gases channeling along the walls and unreduced ores descending in the center, with high fuel consumption and buckshot iron as the result, was too high a price to pay for keeping the walls clean. The plain bell with the gas off-takes at the periphery of the stack is evidently the best and by far the simplest design under our present conditions of raw materials. The problem to obtain a free working furnace on Mesaba ores could, however, not be solved until the correct furnace lines were established.

DEVELOPMENT OF FURNACE LINES

Going back in history, when James Gayley, in 1890, read his memorable paper on the development of American blast furnaces before the British Iron and Steel Institute, he outlined the trend of improvements in his concluding remarks by stating that in the last decade there had been three steps: First, in 1880, the introduction of rapid driving, with large outputs and high fuel consumption; second, in 1885, the production of an equally large amount of iron with a low fuel consumption, by slow driving; and third, in 1890, the production of nearly double that quantity of iron, on a low fuel consumption, through rapid driving. Mr. Gayley himself, who was then in charge of the Edgar Thomson furnaces, was largely responsible for this progress. Much credit also belongs to the management of the Illinois Steel Company, who on their Union and South Chicago furnaces made the best yearly fuel records of that period.

In the early eighties the linings at the Edgar Thomson furnaces had boshes half way up the stack; as, for instance, furnace "D," shown in Fig. 1 in the figures showing furnace lines. This construction was taken over from the charcoal and anthracite practice with hard ores. It was realized that with coke as a fuel and with softer ores, much more rapid driving was not only possible but highly desirable, if it could be done without an increase in fuel. The furnace lines were conformed to this idea and the boshes lowered from 30 to 20 ft., in the period covered by Mr. Gayley's paper. A furnace of this type is illustrated in Fig. 2, showing furnace "F" at Edgar Thomson in 1889. By the rapid yet consistent development of furnace lines and practice in this direction, and by strengthening his blowing equipment accordingly, Mr. Gayley was himself able in a few years to surpass the predictions made in his paper. By 1894 the output of these furnaces had been increased to an average of 400 tons per day with a coke consumption of less than 1900 pounds. This was accomplished by raising the stack from 80 to 90 ft., lowering the bosh to 15 ft., increasing the size of the hearth to 13 ft., thus maintaining the previously established 75 deg. bosh angle. A furnace of that type is shown in Fig. 3, giving Edgar Thomson furnace "H" in 1894.

A few years later Mesaba ores entered into the problem. In lowering the bosh and raising the furnace to 90 ft., still maintaining the 16-ft. stock-line, the angle of the inwall had become steeper (see Fig. 3), and this had the tendency to retard the descent of the charges. The next step taken, therefore, was to increase the batter in the stack, which could be accomplished by narrowing the stock-line and lengthening the straight top section, or by widening the bosh. At the same time the advantage of still lower boshes was realized. These two developments together resulted in the type of furnace shown in Fig. 4, giving the lines of furnace "E" at Edgar Thomson in 1900. Furnaces of this type were able to produce 500 tons of iron per day on a burden of one-third Mesaba ores, but it was difficult to maintain uniform practice owing to accumulation of stock on the flatter bosh. This suggested the return to the 75-deg. bosh angle by the use of still larger hearths, a step which was not taken without hesitation, as we feared an insufficient penetration. But no difficulty of that kind was experienced, and furnaces of this type marked quite an improvement, by establishing the average yearly output of 500 tons per day on 50 per cent. of Mesaba ores with uniform practice. Such a furnace is illustrated in Fig. 5, giving Edgar Thomson furnace "K," built in 1902, which in 1903 averaged 539 tons of iron on 1985 lb. of coke. I have given the Edgar Thomson furnaces as an example, as they were representative of this development and, together with the Duquesne furnaces, established the best blast furnace records of that period.

Similar lines, consisting of a 16-ft. stock-line, ¾ in. to the foot batter of the inwall, a 22-ft. bosh, 14 ft. 6 in. to 15 ft. 6 in. hearth diameter and a 75-deg. bosh angle, were quite generally adopted on 90 and 100-ft. furnaces using Mesaba ores. The percentage of these ores in the burden was gradually increased up to 70 per cent. in the next five years, but not without a distinct increase in coke consumption, as shown by the following figures representing the averages of a large number of American furnace plants using like ores:

Year	Mesaba, per cent.	Coke, lb.
1902	43.8	2155
1903	50.3	2191
1904	55.0	2239
1905	61.0	2275
1906	65.2	2343
1907	68.7	2362

The first experience with these ores had clearly shown that on account of their reducibility, they could be smelted rapidly and with a low fuel consumption, providing the furnace could be made to work uniformly, and the walls could be kept clean. The more regular, faster movement of the stock—by offering less opportunity for the gases to channel, and a more intimate contact and better heat exchange between ores and gases—allows a heavy burden to be carried in spite of the faster driving. The zone where the materials become plastic is kept at a uniformly low level, and there is less danger of scaffolds forming above the bosh. The task, therefore, is to design a furnace in such a way that the least resistance is offered to the free travel of the

stock. With the proper batter already established, the chief impediment remains the bosh. As the melting zone is lowered, the bosh must follow, otherwise the materials will strike the inverted angle before the proper shrinkage through fusion takes place, causing the furnace to hang. Furthermore, a steeper angle should facilitate the stock movement in the bosh, and should, in conjunction with an increased hearth diameter, tend to keep the materials loose in arriving at the tuyere zone, allowing a free penetration by the blast and preventing high blast pressures. These ideas were embodied in successive linings of the furnaces at South Works by increasing the hearth diameter up to 17 ft. 8 in., decreasing the hight of the bosh above the tuyeres below 12 ft., and steepening the bosh angle to 80 deg., a development which is clearly shown by Figs. 8-14 on the table of furnace lines.

In the latest models of these furnaces the bosh is no longer a conspicuous part. The old theory, which attributed to the bosh the function of carrying the weight of the burden, and of narrowing the hearth to the point of proper penetration, must now be modified. The bosh seemingly has but one important duty—that of retarding the melting ores, so they will not run ahead of the coke and darken the tuyeres by reaching them before being properly prepared. There is nothing to indicate that we have reached the limit in low and steep boshes, simply by further widening the hearths and without resorting to such means as the elliptical furnace.

HEARTH DIAMETERS AND RATE OF OUTPUT

The hearth diameter, and not the bosh diameter, must to-day be recognized as the determining factor in influencing the rate of output. In designing new lines, the hearth dimensions should be established first, according to the desired production. By adding a bosh of correct hight and angle, the bosh diameter automatically results.

As will be seen on the table of lines, stacks of different hights are in operation at the South Works. Whereas laboratory tests show that Mesaba ores can be completely reduced in a few hours by furnace gases at suitable temperatures, actual conditions are different. Practical experience proved that even with these easily reduced ores it takes considerable time, first, to thoroughly preheat every particle in a large bulk of ore, and then to bring it into contact with the volume of gases required to complete reduction. This led to a gradual increase in the hight of stacks as the output was increased. Experience seems to show quite clearly that, for Mesaba ores, the proper hight is 90 ft.

A greater hight of the stack than that necessary to accomplish the desired reduction is not only useless, but detrimental by extending the zone where the coke is attacked by CO_2, and unnecessarily increasing the blast pressure. Furnaces which are too low compared to their hearth diameter have too low a blast pressure to give a proper penetration in the combustion zone, if driven at the rate most suitable for economical reduction. If higher blast pressure and better penetration are obtained by increased wind volume, the zone of fusion rises and the time available for preheating and reducing the ore charges becomes too short, resulting in an excessive proportion of "direct" reduction by solid carbon. Furnaces operated in this manner are able to produce as large, or larger, tonnage than similar stacks of greater hight, but will invariably show a higher fuel consumption. The practice of carrying the stock-line at a lower level has the same effect—the tonnage is increased at the expense of fuel consumption, except where the furnaces are too high, in which event they should be cut down rather than jeopardize uniform distribution and life of lining.

The diameter of the stock-line should be carefully chosen to correspond with the hearth and the prospective volume of wind. It should not be appreciably smaller than the hearth, otherwise the dust loss when using fine ores will be excessive. Neither should it be materially larger, as it would be difficult to attain the desired batter of the inwall without extending the cylindrical top section too far down, or inserting too high a cylindrical section above the bosh, both of which are liable to interfere with the smooth travel of the stock. The stock-line approximately determines the size of the bell. With Mesaba ores a bell of from 3 to 5 ft. smaller diameter than the stock-line has given the best results. The method of charging has some influence on this relation.

The number of tuyeres, if kept within certain limits in proportion to the size of the hearth, is of little importance, since not their number but their combined free area determines the degree of penetration with a given wind volume. At the South Works 10 and 12 tuyeres are used with equally good results on the largest hearths.

The relative position of the tuyere level, cinder notch and tapping hole deserve the most careful study. By increasing the hight of the tuyeres above the cinder notch, a larger amount of slag can be held and the clogging of the tuyere zone with slag, which interferes with the combustion, is prevented. The greater the distance between cinder and iron notch levels, the smaller the danger of the iron reaching the cinder notch and causing damage. With a fixed hearth diameter, this distance determines the maximum weight of individual casts. However, it cannot be increased except in proportion to enlarged output, otherwise the bath of iron, removed too far from the active tuyere level and held too long in the furnace, will cool and cause those manifold troubles due to physically cold iron, which affect furnace and steel works practice alike.

Since the character of the ores is changing all over the world, much in the same direction as in this country, the development of furnace lines in other countries will in all probability be similar.

PRESERVATION OF FURNACE LINES

Having established suitable lines, the next problem is to maintain them. Nothing contributes so much to the long life of a lining as a low fuel consumption and uniform practice. The hearth and bosh, which in the early days usually determined the length of a campaign by giving way first, are on our modern furnaces so efficiently cooled and so strongly armored that they outlast the lining in the stack. The ability to maintain the bosh indefinitely by the insertion of cooling plates led to many attempts to follow the same construction in the inwall. But the plates caused the lining to become corrugated between rows and to wear back above the top row, forming shelves highly inducive to scaffold formation. Furthermore, it was not an easy matter to so arrange the plates that they could be exchanged when leaking. Cooling plates above the mantle have only survived where they are placed from 18 to 22 in. back of the face of the inwall, and in this position they have not much effect in preserving the original lines.

These difficulties led to the construction of thin lined furnaces on both sides of the water, from 9 and 13 in. of brick work in this country, and from 3 in. to a mere coating of clay used on a few Ger-

man furnaces. Very thin linings have only proved advantageous for making special grades of iron or when using coarser burdens. With Mesaba ores it is impossible to prevent the fine materials from building up on the cold shell, after the lining is worn away. Therefore, the life of a thin lining is determined by the life of the brick work itself, and this is too short in the case of a 9 or 13½ in. lining to make this construction profitable.

Excessive thickness of a lining has no advantage, since before it wears out the lines become so irregular that economical practice is impossible. From 22½ to 36 in. seems, therefore, the proper thickness. A good lining, if allowed to become properly seasoned and coated will wear slowly and uniformly, providing the stock and blast distribution is correct. A stack lined with a moderately thick lining does not require water cooling, but when the brick work does wear the campaign can be prolonged by the application of water sprays without much deviation from the original lines.

The quality of the fire brick is the next important item in prolonging the life of a lining. The hearth and bosh brick are protected by efficient cooling; the top brick generally by wearing plates. The problem is to obtain brick for the lower inwall which will last without protection. Here they are exposed simultaneously to abrasion and high temperatures. They must, therefore, have a high melting point and yet be hard and tough. The quality of clays and their treatment, as well as the various methods of brick manufacture, enter here. Machine-pressed brick are especially well adapted to meet the requirements of a good inwall, and owing to their correct shapes can be laid with narrower joints. They have given excellent results at the South Works during the past five years, from 600,000 to 800,000 tons of iron being obtained on a lining, and with good practice to the end. In Germany carbon brick are frequently used in the hearth and bosh, with varying results and opinions widely differing as to their value.

A great variety of wearing plates have been designed to protect the stock-line, but very few have proved successful. The plates should be made in small enough sections and of such metal and design that they will neither crack nor warp. To prevent their working loose and interfering with the distribution, they should be tied in with the brick work. Some furnace men prefer to avoid the complication of such arrangement by repairing the brick work at the stock-line during the campaign.

STACK CONSTRUCTION

The strong, riveted, steel plate shell surrounding the brick work is one of the best features of our construction. It is now made so heavy that the lining can be laid quite close against it, insuring tight joints, which are forced to close with the expansion of brick work. The shell may serve the purpose of supporting the top ring, hopper and downcomer pipes, but the skip hoist and dumping mechanism should under no circumstances be attached to it. These must be supported independently to avoid shifting with the expansion of the furnace. The furnace shell protects the brick work and allows weak spots in the lining to be held for long periods by the application of water sprays.

In Germany furnace shells are found only exceptionally and on older furnaces. The construction commonly used there encircles the brick work with steel bands. Many stacks are cooled, sometimes up to the top, by open cast iron water boxes, which are placed between the bands and generally extend to within a few inches of the interior face of the lining. For this construction is claimed the advantage of accessibility when repairs to the brick work are needed. In some instances German stacks have been practically relined without blowing out, by banking below the mantle. The furnace with a steel shell is certainly stronger and safer, and can be kept in blast under conditions which would force an open furnace out of operation. Our practice would seem to prohibit the German construction on account of high blast pressure, loss of gas and danger of ruptures in case of heavy slips. In the bosh, where we employ the German stack construction, they often use a steel jacket, similar to the one employed in this country on Eastern furnaces using magnetites and imported ores. With Mesaba ores the more intense cooling of the water-sprayed jacket causes accumulations to form on the bosh, which periodically melt down, making the practice very irregular.

The gas off-takes should be located as high above the stock-line as possible, out of the path of the falling stock. There should be several, preferably four, and their area should be sufficient to prevent excessive velocity. In this manner, and by turning these off-takes upward before they lead down to the dust-catcher, the amount of flue dust and fine coke carried over has been decidedly reduced. One or more good safety bleeder valves should be provided, so designed that they will give ample relief during heavier slips without allowing any coarse materials to be thrown out.

Gas Cleaning.—The dry gas cleaning system need only consist of one dust catcher of good size and an efficient centrifugal cleaner. These will eliminate practically as much dust as more elaborate arrangements, and are economical in construction and operation. A primary gas washing plant of sufficient capacity to wash all the gas for stoves and boilers should form part of every modern furnace plant. There is no question as to the value of washed gas for stoves, and a proper design of boiler settings, to allow of a free development of the flame and complete combustion before the gases strike the colder surfaces, will render it economical for boilers also.

Stoves.—With washed gas the problem of stove construction becomes comparatively easy. Small checkers can be employed and thereby the heating surface is increased sufficiently so that four large stoves will furnish all the heat required. With clean gas these can be kept in continuous service. They form a simpler layout and are preferable to five smaller stoves on account of better heat economy, less radiation surface and fewer valves.

The latest innovations, which come to us from Germany, claim to increase the capacity and efficiency of existing stoves by using compressed air for combustion or by installing heat interchangers in the chimney flue for preheating the air.

Blowing Engines.—When using fine ores, strong blowing equipment is essential to insure the delivery of a uniform amount of wind, even under conditions of high blast pressure. Gas engines of good design and liberal dimensions have proven to be especially adapted for this service, since the cost of blowing is but little affected by high blast pressures, whereas it can be made almost prohibitive in the case of steam engines in districts of high cost of fuel. The great economy of the gas-blowing engines has been a long established fact. Practice in recent years has proved their reliability in service, and has thereby definitely decided in their favor against reciprocating steam-blowing engines, except in a few localities favored by very low coal prices or at isolated furnace plants where the surplus gas is not utilized, and therefore has no value. With the grad-

ually increasing cost of coal mining and the growing tendency to make economical use of the surplus gas, the gas engine will continue to enlarge its field of usefulness. The steam turbo blower may conquer a position in the localities least favorable to gas engines, owing to its low cost of installation, small space requirement and simple operation. However, practice has not yet definitely proved that it will deliver as constant a supply of air as the reciprocating engine, particularly when fine ores are used, and the resistance in the furnace is subject to considerable and sudden variations.

(To be continued)

A REAL BUSINESS CONDITION

A New England Company Tells the President What Is the Matter

The L. S. Starrett Company, Athol, Mass., manufacturer of engineering and machinists' tools, recently addressed a letter to President Wilson giving the facts about the business depression as the company has had experience and knowledge of it. In the light of the President's address at the White House last Friday asserting the adequacy of his knowledge concerning business conditions and taking a view quite at variance with that of manufacturers in the iron and steel and metal-working trades, this letter of the Athol company is quite significant. It was given circulation among the members of a Massachusetts employees' association and we have the company's permission to reproduce it below:

ATHOL, MASS., June 19, 1914.

WOODROW WILSON, President,
White House, Washington, D. C.

Mr. President: The newspapers report you as saying that the present business condition is a psychological depression. We do not know whether the intended meaning of this expression is that the depression is merely a state of mind and has no actual existence, or that there is an actual depression which is due to a state of mind.

If the expression is intended to mean that there is no actual business depression, but that certain people are trying to create the impression that such a state of affairs exists for political or other ulterior purposes, we beg leave to assure you that your information is entirely wrong.

The business depression is very real. The business of this company has been poor for a year and has been steadily growing worse: Our business in the past month, May, was 25 per cent. less than it was in May, 1913, and this notwithstanding the fact that we have made extra effort to get business in various ways, one of which is by increasing our advertising 43 per cent. over that done in the corresponding month last year.

A BAROMETER OF TRADE CONDITIONS

Our business is in a way a very good barometer or gauge of actual business conditions throughout the country. We make tools which are bought and used by machinists, carpenters, and other workmen. When business is good in the manufacturing and building trades, our sales of tools are good; when business is poor in those industries and workmen are laid off or put on short time, or in fear of being laid off or put on short time, our sales decrease. We sell to the retail trade all over the country and have traveling salesment covering the whole country. These salesmen are unanimous in reporting lack of business in their territories and their orders substantiate these reports. We receive about the same number of orders as usual, but the orders are very small. Dealers are buying only from hand to mouth; they will not order goods in quantities.

If the expression referred to is intended to mean that the business depression now prevailing is due to a state of mind, we agree with you in part. We believe that a large part of the business depression is due to the recently enacted tariff law, which we have no doubt is responsible for a large part of the closed shops, short-time schedules and poor business generally which the country has suffered for months, and that this tariff law promotes the welfare of workmen in foreign countries at the expense of the workmen of the United States.

Aside from this, we believe that the present business depression is due in a large measure to a state of mind, but something occasions this state of mind. Business in general is not "playing politics," or crying calamity for political purposes. We do not know anything about so-called "big business"; we are not in any trust or combination and have no connection with any. We have a little plant of our own, employing 750 people, and we attend strictly to the business of making and selling tools. There are thousands of other factories throughout the country which have no connection whatever with so-called "big business," which feel, as we do, the disastrous result of the new tariff law and the psychological condition, if that is what you prefer to call it.

FEAR A COMPELLING FACTOR

We believe that this state of mind which causes business to be over cautious at present is wholly due to a fear of what may be done at Washington. We formerly and for many years had a good business in the Philippine Islands. A gentleman in the hardware trade in Manila was in our office recently and stated to us that the policy of the present administration in turning out Americans from positions of responsibility there and replacing them with Filipinos had almost entirely killed business in those islands. He said that in the preceding eight months more had been done to kill business there than could possibly be remedied in three years if conditions could be at once brought back to their former status.

We believe that it is the duty of the present Congress to adjourn at the *earliest possible moment*, and allow business to have a little rest from fear of disturbing legislation.

We believe that it is *your* patriotic duty to interpose no obstacle to the immediate adjournment of Congress, but rather to favor such an adjournment.

We read in the papers that members of Congress have been flooded with letters and telegrams, urging them to adjourn, and that this movement has been ascribed to the improper motives of "big business interests."

We have written to each member of Congress and each Senator from Massachusetts, asking for an early adjournment of Congress. We assure you, however, that our action in this matter was not due to any advice from any publication, association or anybody else. We are members of the National Association of Manufacturers, but have received no communication from that association whatever, asking us to write members of Congress on the subject. Those letters and this one to you are written solely on our own responsibility and on our own initiative. We believe that is a duty we owe to our workmen, their families, as well as our stockholders and their families, to protest against further disturbing legislation on the part of Congress and to urge that Congress immediately adjourn the session which has kept the country on the rack for the past year and a half, and give business a chance to get busy.

The writer is not a politician—never was one—never ran for office, and does not want any. What he wants is to see the wheels go 'round.

The Monarch Metal Mfg. Company, which recently moved from Kansas City, Mo., to Canton, Ohio, has changed its name to the Zahner Metal Sash & Door Company. This company was recently incorporated and has now increased its capital stock to $600,000. A new plant has been built in Canton which has just been placed in operation.

ESTABLISHED 1855

THE IRON AGE

Published Every Thursday by the DAVID WILLIAMS CO., 239 West Thirty-ninth Street, New York

W. H. Taylor, *Pres. and Treas.* Charles G. Phillips, *Vice-Pres.* Fritz J. Frank, *Secretary* M. C. Robbins, *Gen. Mgr.*

BRANCH OFFICES—Chicago: Otis Building. Pittsburgh: Park Building. Boston: Equitable Building. Philadelphia: Real Estate Trust Building. Cleveland: New England Building. Cincinnati: Mercantile Library Building.

Subscription Price: United States and Mexico, $5.00 per year; to Canada, $7.50 per year; to other foreign countries, $10.00 per year. Entered at the New York Post Office as Second-class Mail Matter.

EDITORS

GEO. W. COPE A. I. FINDLEY W. W. MACON

CHARLES S. BAUR, *Advertising Manager*

Finished Laws on Business

President Wilson said last week to the Virginia editors in making his proclamation of prosperity, that the administration's programme of legislation affecting business would be carried out in full and that Congress would not be long in doing this. "Because," he added, "when the programme is finished, it is finished." If the President is right in so thinking, business might say, in all resignation of spirit, If it were done when 'tis done, then 'twere well it were done quickly. But will it be "finished"? Concerning one portion of it — that which has to do with the trusts—the New York Evening Post says skeptically:

> In one point Mr. Wilson runs pretty near to fatuity. This is where he assures business men that the bills in question, when once enacted, will write finis to the whole book of trust legislation. There will be no other measures debated, no more agitation. But can he give any such guarantee? For his own administration, doubtless. But can he be certain that no other politician will arise to tell the people that this or the other hook must be put in the nose of Big Business before the country can be quite safe and happy?

It is all quite beyond the ken of any man — President or private citizen. But whatever may be said about trust legislation, no greater mistake could be made than to look upon tariff legislation as "finished," because a certain bill cutting in two most duties and making many additions to the free list was passed last year. A large number of manufacturers and other business men consider this new legislation to be responsible for no small part of the existing hesitation and depression. That belief has much to do with determining their business policy. They were notified months in advance that the object of this bill was to lower the level of commodity prices in the United States. Every move they have made since receiving this notification, and later the repeated assurance from those responsible for the bill that prices would go down, has been with constant thought of having on hand the smallest possible amount of higher priced stock. The whole business world has thus been perforce riding for a fall in values. Since the predicted low prices have not come in food and clothing and rents, the country has been told that the readjustment will take time and that too much must not be expected at once.

It is a condition in which no programme of business legislation can be called "finished." The present tariff, whether it brings low prices in certain manufacturing lines or whether it continually fails to reduce the cost of living, is far from being a finished thing. It is to be a first class issue in the Congressional campaign this fall, and in the next Congress both its friends and foes are likely to try to amend it—the former to get more revenue out of it and the latter to give less chance to foreign makers to enter this market or to depress our prices by compelling the meeting of their low offers.

What most of all will prevent business legislation from reaching a finished state is the idea which more and more has come to possess the Congressional mind, that business is that out of which legislation — vote-getting legislation — is made.

The Railroad Position

What amounts to an official statement of railroad operations in April has just been presented by the Bureau of Railway Economics, which is a private institution of the railroads, but has access to the same reports as are made to the Interstate Commerce Commission.

The April returns, compared with those of April, 1913, show per mile of line reporting (224,053 miles in 1913, 225,821 miles in 1914) a decrease of $44 or 4.1 per cent. in total operating revenues, a decrease of $40 or 5.0 per cent. in total operating expense and a decrease of $4 or 1.5 per cent. in net operating revenue. The decrease in the total operating revenue is unfavorable, but may be assumed to have been due to unfavorable general business conditions. That the decrease in expenses was almost as great as the decrease in gross revenue is very favorable, and results in a very small percentage decrease in net operating revenue. While it is frequently suggested that on account of the floods in the Central West late in March, 1913, comparisons at this time are apt to be misleading, the fact is that district returns do not suggest any divergence in the flood district from the other districts.

The four months of the calendar year ending April do not make altogether as favorable a showing, the decrease in gross being 5.7 per cent., in expenses only 3.4 per cent. and in net operating revenue as much as 12.4 per cent. It may be noted that the recent showings are much more favorable, as to both gross and net, than those of the early months of 1908, when there was a temporary business depression.

Freight car orders are often taken as an index of railroad activity. Thus far this year orders have been placed at the rate of about 130,000 freight cars per annum, which compares not altogether unfavorably with 1913, for which year the

Railway Age Gazette reported 146,732 freight cars ordered. We must go back more than eight years in order to substantiate claims that the railroads ought to be ordering cars at the rate of 200,000 or 300,000 a year, for since 1906 the average has been only 150,000 cars a year. In 1905 the maximum was reported, 341,315 cars, while as far back as 1901 and 1902 the annual orders were nearly 200,000 cars. As with the replacement of old light rails with heavy rails, suited to modern traffic conditions, a replacement which culminated in 1906, it may possibly prove to be the case that the great part of the work in putting new and large cars into service has already been done. Indeed, the Railway Age Gazette's annual statistics show a total of about 2,200,000 cars built from 1899 to 1913, inclusive. As this is within about 10 per cent. of the total number of cars in existence, and as cars built in 1899 can hardly have worn out by this time in any great number, these statistics are very remarkable. They may be set in opposition to the case recently unearthed by the Interstate Commerce Commission of a certain Western road charging annually 1 per cent. depreciation against its rolling stock, apparently on the curious hypothesis that it would last 100 years.

The announcement of the long expected rate decision, together with the prospect of extremely heavy crops, may result in fairly heavy buying of freight cars in the next few weeks, but in general it seems fair to conclude that there will never again be such an era of car building as marked the years 1905-6-7. In those three years the cars built equaled about 30 per cent. of the number now in existence. As has been repeatedly pointed out, the aim of the railroads is to increase their capacity by increasing the car loading to an average more nearly in keeping with the capacity of the cars, and to move the cars more miles per day.

Recasting the Iron and Steel Industry

From time to time it has been thought that the iron and steel industry had reached a stage bordering on finality; but developments have always shown processes to be as much in a state of flux as ever. At intervals of really only a few years the whole industry is recast. As one looks backward, indeed, the intervals seem to grow longer and longer; the greatest and most sudden changes have always occurred in the relatively near past. For centuries the wrought product was made chiefly by the Catalan forge and its modifications, while its successor, the puddling furnace, held the vogue for at least a century.

One might suggest that the change from wrought iron to mild steel was so sudden and radical that no change of equal significance could occur thereafter; but such a view can be combated. It is a trifle over 20 years ago that the production of steel in the United States first exceeded the production of wrought iron, but at that time both the Bessemer converter and the open-hearth furnace were 35 or 40 years old, and the Bessemer converter had been the chief producer of rail material—though of nothing else—for about 15 years. Nor does it follow that the change from the puddling furnace to the converter or open-hearth furnace is necessarily more striking than any other change that could occur in the industry. As a matter of fact, the greatest change which occurred in the industry some 20 to 25 years ago was purely incidental to the change in the process of manufacturing the raw wrought product. It chanced that steel could be rolled more easily than iron, and accordingly rolling mills were rebuilt and continuous trains introduced. If steel had to be rolled in the same manner in which iron was rolled, the change from wrought iron to steel would not have left such an impress in history as it did, of marking a new epoch.

In rolling, moreover, there have been great changes aside from those occasioned by the replacement of wrought iron by steel. In the blooming operation there was first the two-high mill, to be replaced by the three-high, as a great improvement, while in recent years the trend has been strongly towards the two-high again. In this, as in many other changes that have occurred, there have been incidental but really governing causes. The perfection of the reversing blooming mill engine of tremendous power, 20,000 hp. or more, was really the cause of the return to the two-high mill, and of late the electric motor has been promising equal or greater efficiency in this direction.

The entire plan of steel works has been modified, well nigh governed, by improvements in handling apparatus. So apparently minor an implement as the lifting magnet may make important changes in the layout of a steel plant, while in blast furnace planning the whole design is more or less subservient to the possibilities and limitations of the ore-handling system.

These hints should be sufficient to indicate that no stage of finality has come in sight in the general form of the steel industry, and as invention has not ceased there is no prospect of such final crystallization in the future. Fifteen years ago, in 1899, if one looked backward 15 years, to 1884, he found things altogether different. If from the present one looks backward 15 years, to 1899, he finds practically as much difference, and who can say that if a look 15 years into the future were possible it would not disclose as great differences from the present?

It is true the changes from time to time do not fall into the same category. At one time they have been in converting the pig iron or scrap into the wrought form; at another time in the style of mills; at other times great changes have occurred in methods of driving mills, while again invention and improvement have run largely to the handling of material. Of late one of the greatest changes has been in the physical characteristics of the steel, through improvements in composition and in heat treatment. In the sheet industry there has been another description of improvement in quality, with respect to the surface finish, for sheets today are produced with a surface finish not dreamed of even a decade ago, and are thus applicable to uses which otherwise could not be considered.

An awkward element in the general steel situation is that these changes cost money and it is not universally recognized that an account should be maintained for them. In mine accounting the

thing is worked out, for it is known that the mineral may be exhausted in a certain time; but when a new and improved mill appliance is installed no one can ascribe to it a certain number of years of earning power. Nevertheless, all the lessons of the past, clear up to the present time, indicate conclusively that the number of years is relatively small.

CORRESPONDENCE

The "Good Fellow" Salesman Is Disappearing

To the Editor: "It is not necessary to be a 'good fellow' in order to sell machinery," the sales manager of one of the largest concerns in its particular field said to me recently. "In most cases the worst that the teetotaler gets is an even break, and in a lot of others he is given all the better reception by reason of keeping his proposition on a strictly business basis."

The matter of drinking, in all its phases, has been uppermost in the public mind for some time of late. As a matter of personal efficiency, it is now realized that drinking cannot help and may hurt. However, the practice is condoned here and there on the ground that it is necessary in order to get business, and that the man on the road must be a "good fellow" if he is to turn in his fair proportion of sales. Hence the subject is one with a strictly business aspect, entirely apart from the effect of the drinking habit on those who have it.

That the theory of increased selling efficiency resulting from free drinking with customers and those in a position to influence sales has been exploded is the opinion of a good many who have been interviewed recently on the subject. "I myself," said the sales manager referred to above, "don't drink at all. I am what some people would call a crank on the subject; and yet I don't believe I have ever lost any business simply because I didn't drink.

"Some time ago I was in keen competition with several concerns for one of the largest orders of the year. The prospect seemed to be a good fellow himself, and I supposed that the other good fellows in the bunch of salesmen would probably get the inside track. But I not only did not invite him to drink, but I declined his invitation, explaining the reason. He looked at me queerly and finally said it was the first time he had ever seen a salesman refuse an invitation of that kind. Nevertheless, he gave me as much time as the others when he took up the question of buying the equipment for which he was in the market. I got the order simply because I demonstrated that we had the best proposition for his particular plant. Possibly the fact that I got nine hours sleep the night before and was clear headed helped me to argue my case. At any rate, this incident, where apparently I handicapped myself through not drinking, convinced me that it is an entirely unnecessary burden on the physique of the salesman and expense to his house."

This last phase deserves consideration. Expense accounts are crowded with items referring to entertainment of customers, and a good deal of the money so expended is probably for drinks. If it isn't necessary to spend the money in this way, it is obviously poor judgment to authorize it. If it is not only unnecessary but a handicap to the man, then there isn't a shred of an excuse left for the practice.

It goes without saying that the salesman must make himself personally agreeable to the prospect, and there are times when this means dining, but not necessarily wining, the man who has the business to place. A certain amount of leeway in this regard is necessary. But where once it was considered proper to go the limit in staying up as much of the night as might be desired with a customer, many business men now believe that it is a waste of energy which might better be spent in other directions.

"The business of the man who has to be caroused with in order to win his approval," said one machinery man, "usually is not worth much. Certainly it costs too much to get it. But most buyers nowadays are too much interested in the question of getting one hundred cents worth of value for each dollar expended that they prefer not to have the salesman try to influence their judgment through paying for dinners and drinks and cigars."

In large concerns the methods used in purchasing are working more and more against the professional "good fellow." Few purchasing agents can be approached from this side; for they too are trying to make every dollar go as far as possible in getting equipment and supplies. Some years ago it was the general belief that the purchasing departments of the railroads could be influenced through this and similar means, but now those who sell to the carriers approach them with an open-and-shut proposition based entirely on the ability of their product to do the work and on its cost.

The modern type of salesman, who is becoming more and more familiar in the machinery field, is a clean-cut young chap, college-bred, or at least technically trained, who knows his goods thoroughly, and who studies the plant and operations of his customers. He is prepared to render real service in suggesting the type and size of machine needed for the work and assisting in its installation. But when it comes to being a "good fellow" of the old-fashioned sort, he is not in the running.

Selling machinery on a business basis has made the situation easier for everybody. It means less expense to the manufacturer and in the end less cost and better service to the customer. In short, cutting out the old brand of good fellowship and sticking strictly to business is not only in line with real efficiency, but really more agreeable; because no one wants to have to buy business with gratuities, and no buyer wants to tie up with a house which gets its trade in that way.

G. D. CRAIN, JR.

LOUISVILLE, KY., June 20, 1914.

System in Mailing

To the Editor:—Every buyer has trouble in getting quotations from manufacturers or dealers on short notice. He looks for an answer to his inquiry in two to four days, according to the distance which the mail has to travel. The recipient of the inquiry may think that he has replied promptly but if his letter has missed the outgoing mail by as little as ten minutes it may make a day's difference in the arrival at its destination.

There is probably in almost every shipping department a schedule indicating the time at which shipments must leave so as to get on the fast freights of each day. In seaport cities like New York and Boston exporters keep close tabs on foreign mails and especially supplementary mails. Tables giving this information are published in the daily papers and are of great value to those interested, and yet hardly any one considers it worth while to keep at hand a schedule of the departure of domestic mails.

No doubt this information is printed in the local papers throughout the country or else can be obtained from the postmasters. In fact, I well remember that the weekly newspaper in the little town from which I migrated had a mail schedule in every issue. However, if such information is still obtainable it is not being as generally used as it might be. Consider the advantage, for instance, of a firm in a suburb of Chicago knowing when a letter should be mailed to insure its leaving that city the same day for New York.

H. D. MURPHY.

JERSEY CITY, N. J., June 12, 1914.

The Keystone Coal & Coke Company, 522 Commercial Trust Building, Philadelphia, Pa., announces the appointment of Alley & Page, New York and Boston, as sales agents for its foundry coke for New England and for New York east of the Hudson River.

FOUNDRYMEN AT CHICAGO

But One Branch of the Industry to Be Considered at Each Session

Announcement is made by President Alfred E. Howell and Secretary-Treasurer A. O. Backert, whose office is at Twelfth and Chestnut streets, Cleveland, of the tentative programme for the 1914 convention of the American Foundrymen's Association. More than 30 papers and addresses have already been arranged for by the special programme committee of which J. J. Wilson, Cadillac Motor Car Company, Detroit, is chairman. Registration begins on Monday, September 7, at the La Salle Hotel, and in the evening of Monday the Associated Foundry Foremen hold their banquet at this hotel. The opening of the convention will be a joint session Tuesday morning of the American Foundrymen's Association, the American Institute of Metals and the Associated Foundry Foremen. There will be the address of welcome, the presidential addresses and a number of papers on "Safety Work in Foundry Operations." On Tuesday afternoon the American Foundrymen's Association will hold a separate session at which papers will be presented on "Foundry Construction and Equipment."

At 10 a.m. Wednesday a joint meeting will be held with the American Institute of Metals at the Saddle and Sirloin Club, adjacent to the International Amphitheater where the Foundry & Machine Exhibition Company will conduct its exhibition of foundry equipment and supplies. This session has been termed a "Cost Congress." Papers will be read and addresses delivered on the necessity of ascertaining exact costs in foundry operations. How to make bids for work will be discussed and a report on this subject will be submitted. The Cost Committee of the American Foundrymen's Association will present its annual report, suggesting a revision of the standard foundry cost system and a number of papers also will be read on efficiency in foundry operations.

The Wednesday afternoon session will be devoted to the discussion of malleable foundry practice. A number of papers will be presented by successful malleable foundrymen.

Steel foundry practice will be the subject of Thursday morning's session, the programme being arranged by R. A. Bull, senior vice-president of the American Foundrymen's Association. A number of interesting and valuable papers have been promised and the report of the special committee on steel foundry work will be submitted. Gray-iron foundry practice will be the exclusive subject of the meeting of Thursday afternoon.

The entertainment features of the meeting include a luncheon for ladies at the Stockyards Inn Wednesday noon, and Wednesday afternoon will be given up to a Stockyards inspection. Visiting foundrymen and guests will be entertained Wednesday evening at the White City. On Thursday evening a banquet will be held at the La Salle Hotel for members only. Speaking will be limited to one or two addresses by men known nationally. There will also be a banquet for ladies at the La Salle Hotel Thursday evening.

The local committee will give visiting foundrymen every facility for inspecting foundries in Chicago and vicinity. Practically all the large plants in the district have extended an invitation to the visitors. The arrangement of the programme devoting a session to one branch of foundry work only will release foundrymen in other lines for these trips.

Central Steel Company Incorporated

The Central Steel Company, Massillon, Ohio, has been incorporated with a capital stock of $5,000,000 by interests that control the Massillon Rolling Mill Company, the Canton Stamping & Enameling Company, Canton, Ohio, and the American Stamping & Enameling Company, Bellaire, Ohio. The incorporators are H. M. Geiger, H. F. Bachelor, F. J. Griffith, R. E. Bebb and A. C. Fenwick, of Canton. These interests now have under construction an open-hearth steel plant in connection with the plant of the Massillon Rolling Mill Company.

CONTENTS

The Pennsylvania Rail Order Largely on Present Specifications

The Pennsylvania Railroad makes the following official statement of the steel rail order for the system for 1914 delivery: The steel rail requirements of the Pennsylvania Railroad system will amount to 137,032 tons, of which 37,032 tons have been ordered, and bids have been requested for the additional 100,000 tons still to be ordered. The company desires definitely to ascertain the results of using a heavier section than 100 lb. per yard, therefore it has included in this year's order 15,000 tons of rails weighing 120 lb. to the yard. The remainder of the order is of 100-lb. section, substantially on the present specifications.

The American Society of Engineers, Architects and Constructors will hold its first annual convention at Brighton Beach Casino, New York City, July 3 and 4. The president of the society is Major Samuel S. Hatfield, U. S. assistant engineer, New York City; first vice-president, Oliver Randolph Parry, architect, Philadelphia; second vice-president, Charles N. Green, civil engineer, New York City; treasurer, Charles F. Dingman, constructor; secretary, T. Hugh Boorman, civil engineer, New York City. The programme provides for the reading of a number of papers on engineering subjects and a banquet will be held on the evening of July 3.

The Iron and Metal Markets

GRADUAL BETTERMENT

The Expectation for the Second Half Year

Steel Corporation Bookings Increase — Sales of 65,000 Tons of Basic Pig Iron

The steel trade enters the second half of the year generally looking for a gradual increase in demand, but it is recognized in view of the large amount of slack to be taken up, that improvement in prices may be deferred for some months. June buying was larger in the first half than in the second half, with some companies. The Steel Corporation, with its foreign trade and its diversity of products, has done better of late than in early June.

With its output in June averaging 1000 tons a day more than in May, the Steel Corporation may be able to report that new orders for the past month practically offset shipments. If there is any increase in unfilled orders it will be small. Of late new bookings have run ahead of production, having averaged 30,000 tons a day. They were down to 20,000 tons a day for most of May. Operations today are at the rate of 65 per cent. of ingot capacity. Of blast furnace capacity, 58 per cent. is active. One Central furnace at Cleveland has been blown in.

June brought nothing that can be called free contract buying in finished material and it will come late if at all this year. The needs of manufacturing consumers are fairly well covered for the third quarter and no marked activity is probable in July.

With orders for more than 15,000 cars placed in June, that month proved the best of the year. It will soon be known whether the rate decision is automatically to release 10,000 or so more. A spike order for 5000 kegs placed by the Illinois Central breaks an embargo of several months in this trade. Spike inquiries by several roads, including the B. & O., the Seaboard Air Line and the C. & O., amount to 20,000 kegs.

The fact that the rail mill at the Canadian Soo recently competed for 3000 tons of rails for an Ohio road and bid under the prices of domestic mills, has caused some comment. This is the first counter movement to a long series of American rail sales in Canada.

The Steel Corporation's export trade has improved in recent weeks, the Far East leading in the betterment and South America following. The order of the Siamese State Railways placed here was for 12,000 tons of rails.

The Anglo-Persian Oil Company has placed 15,700 tons of 10-in. pipe for a new 170-mile line in Persia, with the National Tube Company. A large oil pipe order for Burmah is pending. The domestic pipe trade was good in June, the month's orders for the largest maker being 50 per cent. more than in May, but May was a very lean month.

Sheet mill running schedules have been improved, the recent slump in prices bringing out business. The American Sheet & Tin Plate Company is operating 63 per cent. of capacity this week, after having dropped below 40 per cent. and even then depending in part on exports.

Adjustments of Central Western sheet bar contracts for the third quarter are probable at $20, Pittsburgh or Youngstown. In some cases where the price is based on pig iron, third quarter deliveries will be at less than $20.

Pig iron sales for June were large by comparison with previous months, but prices settled, on Southern iron going to the low level for the year. Three Ohio furnaces will blow out this week, and in the Hanging Rock district others will follow, leaving but one or two active there by August 1. Southern iron for the second half has largely sold at $10.25 for Birmingham for No. 2, but $10 has been done for the third quarter. Alabama stocks have increased.

Basic pig iron at Pittsburgh has been more active than market reports have indicated. One interest reports sales of 65,000 tons for delivery in third and fourth quarters, the bulk of it at $13 Valley furnace.

A Comparison of Prices

Advances Over the Previous Week in Heavy Type, Declines in Italics

At date, one week, one month, and one year previous

	July 1, 1914.	June 24, 1914.	June 3, 1914.	July 2, 1913.
Pig Iron, Per Gross Ton:				
No. 2 X, Philadelphia....	$14.75	$14.75	$14.75	$15.75
No. 2, Valley furnace...	13.00	13.00	13.00	14.00
No. 2 Southern, Cin'ti...	13.50	13.50	13.75	13.75
No. 2, Birmingham, Ala.	10.25	10.25	10.50	10.50
No. 2, furnace, Chicago*	13.75	13.75	14.00	14.50
Basic, del'd, eastern Pa.	14.00	14.00	14.00	15.50
Basic, Valley furnace....	13.00	13.00	13.00	14.50
Bessemer, Pittsburgh....	14.90	14.90	14.90	16.90
Malleable Bess., Ch'go*..	14.00	14.00	14.00	14.75
Gray forge, Pittsburgh..	13.65	13.65	13.65	14.65
L. S. charcoal, Chicago.	15.75	15.75	15.75	15.75
Billets, etc., Per Gross Ton:				
Bess. billets, Pittsburgh..	19.00	19.00	20.00	26.50
O.-h. billets, Pittsburgh..	19.00	19.00	20.00	26.50
O.-h. sheet bars, P'gh....	20.00	20.00	21.00	27.00
Forging billets, base, P'gh.	25.00	25.00	25.00	34.00
O.-h. billets, Phila.....	*21.90*	22.40	22.40	28.00
Wire rods, Pittsburgh...	24.50	24.50	24.50	28.50
Old Material, Per Gross Ton:				
Iron rails, Chicago.....	*12.25*	12.75	12.75	14.00
Iron rails, Philadelphia.	15.00	15.00	15.00	17.50
Carwheels, Chicago.....	*11.25*	11.50	11.50	13.00
Carwheels, Philadelphia.	11.00	11.00	11.25	13.00
Heavy steel scrap, P'gh.	11.50	11.50	11.50	12.50
Heavy steel scrap, Phila	10.50	10.50	10.50	11.50
Heavy steel scrap, Ch'go	9.75	9.75	9.50	10.50
No. 1 cast, Pittsburgh...	11.50	11.50	11.50	12.75
No. 1 cast, Philadelphia.	12.00	12.00	12.00	13.00
No. 1 cast, Ch'go (net ton)	9.75	9.75	9.75	10.50
Finished Iron and Steel, Per Lb. to Large Buyers:	Cents.	Cents.	Cents.	Cents.
Bess. rails, heavy, at mill	1.25	1.25	1.25	1.25
Iron bars, Philadelphia..	1.17½	1.17½	1.20	1.47½
Iron bars, Pittsburgh...	1.25	1.25	1.25	1.65
Iron bars, Chicago.....	*1.00*	1.05	1.10	1.50
Steel bars, Pittsburgh...	1.10	1.10	1.12½	1.40
Steel bars, New York...	1.26	1.26	1.28½	1.56
Tank plates, Pittsburgh.	1.10	1.10	1.10	1.45
Tank plates, New York..	1.26	1.26	1.26	1.61
Beams, etc., Pittsburgh.	1.10	1.10	1.12½	1.45
Beams, etc., New York..	1.26	1.26	1.28½	1.61
Skelp, grooved steel, P'gh	1.15	1.15	1.20	1.45
Skelp, sheared steel, P'gh	1.20	1.20	1.25	1.50
Steel hoops, Pittsburgh..	1.25	1.25	1.25	1.60
Sheets, Nails and Wire, Per Lb. to Large Buyers:	Cents.	Cents.	Cents.	Cents.
Sheets, black, No. 28, P'gh	1.80	1.80	1.85	2.25
Galv. sheets, No. 28, P'gh	2.75	2.75	2.75	3.35
Wire nails, Pittsburgh..	1.50	1.50	1.50	1.70
Cut nails, Pittsburgh...	1.55	1.55	1.55	1.70
Fence wire, base, P'gh...	1.30	1.30	1.30	1.50
Barb wire, galv., P'gh...	1.90	1.90	1.90	2.10

*The average switching charge for delivery to foundries in the Chicago district is 50c. per ton.

Coke, Connellsville,

Per Net Ton at Oven:	July 1, 1914.	June 24, 1914.	June 3, 1914.	July 2, 1913.
Furnace coke, prompt...	$1.75	$1.75	$1.75	$2.25
Furnace coke, future....	1.85	1.85	1.90	2.25
Foundry coke, prompt...	2.30	2.30	2.40	2.75
Foundry coke, future...	2.50	2.50	2.50	3.00

Metals,

Per Lb. to Large Buyers:	Cents.	Cents.	Cents.	Cents.
Lake copper, New York	13.87½	14.12½	14.25	15.00
Electrolytic copper, N. Y.	13.40	13.75	14.00	14.62½
Spelter, St. Louis.....	4.90	4.90	4.95	5.15
Spelter, New York.....	5.05	5.05	5.10	5.30
Lead, St. Louis.....	3.77½	3.80	3.80	4.22½
Lead, New York.....	3.90	3.90	3.90	4.35
Tin, New York.....	30.45	30.75	30.45	41.75
Antimony, Hallett's, N. Y.	6.75	6.75	6.87½	8.00
Tin plate, 100-lb. box, P'gh.	$3.30	$3.30	$3.30	$3.60

Finished Iron and Steel f. o. b. Pittsburgh

Freight rates from Pittsburgh, in carloads, per 100 lb.: New York, 16c.; Philadelphia, 15c.; Boston, 18c.; Buffalo, 11c.; Cleveland, 10c.; Cincinnati, 15c.; Indianapolis, 17c.; Chicago, 18c.; St. Louis, 22½c.; Kansas City, 42½c.; Omaha, 42½c.; St. Paul, 32c.; Denver, 84½c.; New Orleans, 30c.; Birmingham, Ala., 45c.; Pacific coast, 80c. on plates, structural shapes and sheets No. 11 and heavier; 85c. on sheets Nos. 12 to 16; 95c. on sheets No. 16 and lighter; 65c. on wrought pipe and boiler tubes.

Plates.—Tank plates, ¼ in. thick, 6¼ in. up to 100 in. wide, 1.10c. to 1.15c., base, net cash, 30 days. Following are stipulations prescribed by manufacturers with extras:

Rectangular plates, tank steel or conforming to manufacturer's standard specifications for structural steel dated February 6, 1903, or equivalent, ¼ in. and over on thinnest edge, 100 in. wide and under, down to but not including 6 in. wide, are base.

Plates up to 72 in. wide, inclusive, ordered 10.2 lb. per sq. ft., are considered ¼-in. plates. Plates over 72 in. wide must be ordered ¼ in. thick on edge, or not less than 11 lb. per sq. ft., to take base price. Plates over 72 in. wide ordered less than 11 lb. per sq. ft. down to the weight of 3-16 in. take the price of 3-16 in.

Allowable overweight, whether plates are ordered to gauge or weight, to be governed by the standard specifications of the Association of American Steel Manufacturers.

Extras	Cents per lb.
Gauges under ¼ in. to and including 3-16 in....	.10
Gauges under 3-16 in. to and including No. 8....	.15
Gauges under No. 8 to and including No. 9....	.25
Gauges under No. 9 to and including No. 10...	.30
Gauges under No. 10 to and including No. 12...	.40
Sketches (including straight taper plates), 3 ft. and over	.10
Complete circles 3 ft. in diameter and over.....	.20
Boiler and flange steel	.10
"A. B. M. A." and ordinary firebox steel.....	.20
Still bottom steel	.30
Marine steel	.40
Locomotive firebox steel	.50
Widths over 100 in. up to 110 in., inclusive....	.05
Widths over 110 in. up to 115 in., inclusive....	.10
Widths over 115 in. up to 120 in., inclusive....	.15
Widths over 120 in. up to 125 in., inclusive....	.25
Widths over 125 in. up to 130 in., inclusive....	.50
Widths over 130 in.	1.00
Cutting to lengths, under 3 ft., to 2 ft., inclusive	.25
Cutting to lengths, under 2 ft., to 1 ft. inclusive	.50
Cutting to lengths, under 1 ft.	1.55

No charge for cutting rectangular plates to lengths 3 ft. and over.

Structural Material.—I-beams, 3 to 15 in.; channels, 3 to 15 in.; angles, 3 to 6 in. on one or both legs, ¼ in. thick and over, and zees, 3 in. and over, 1.10c. to 1.15c. Extras on other shapes and sizes are as follows:

	Cents per lb.
I-beams over 15 in.	.10
H-beams over 18 in.	.10
Angles over 6 in. on one or both legs.	.10
Angles, 3 in. on one or both legs, less than ¼ in. thick, as per steel bar card, Sept. 1, 1909....	.70
Tees, structural sizes (except elevator, handrail, car truck and conductor rail)	.05
Channels and tees, under 3 in. wide, as per steel bar card, Sept. 1, 1909	.20 to .80
Deck beams and bulb angles	.30
Hand rail tees	.75
Cutting to lengths, under 3 ft. to 2 ft. inclusive	.25
Cutting to lengths, under 2 ft. to 1 ft. inclusive	.50
Cutting to lengths, under 1 ft.	1.55

No charge for cutting to lengths 3 ft. and over.

Wire Products.—Fence wire, Nos. 0 to 9, per 100 lb., terms 60 days or 2 per cent. discount in 10 days, carload lots to jobbers, annealed, $1.30 to $1.35; galvanized, $1.70 to $1.75. Galvanized barb wire and fence staples to jobbers, $1.90 to $1.95; painted, $1.50 to $1.55. Wire nails to jobbers, $1.50 to $1.55. Woven wire fencing, 73½ per cent. off list for carloads; 72½ off for 1000-rod lots; 71½ off for less than 1000-rod lots.

The following table gives the price to retail merchants on fence wire in less than carloads, with the extras added to the base price:

Plain Wire, per 100 lb.

Nos.	0 to 9	10	11	12&12½	13	14	15	16
Annealed	$1.50	$1.55	$1.60	$1.65	$1.75	$1.85	$1.95	$2.05
Galvanized	1.95	1.95	2.00	2.05	2.15	2.25	2.65	2.75

Wire Rods.—Bessemer, open-hearth and chain rods, $24.50 to $25.

Wrought Pipe.—The following are the jobbers' carload discounts on the Pittsburgh basing card on steel pipe in effect from April 20, 1914, and iron pipe from June 2, 1913, all full weight:

Butt Weld

Steel			Iron		
Inches	Black	Galv.	Inches	Black	Galv.
⅛, ¼ and ⅜	73	52½	⅛ and ¼	66	47
½	77	66½	⅜	65	46
¾ to 3	80	71½	½	69	56
			¾ to 2½	72	61

Lap Weld

2	77	68½	1¼	56	45
2½ to 6	79	70½	1½	67	56
7 to 12	76	65½	2	68	58
13 to 15	53	..	2½ to 4	70	61
			4½ to 6	70	61
			7 to 12	68	55

Reamed and Drifted

1 to 3, butt	78	69½	1 to 1½, butt	70	59
2, lap	75	66½	2, butt	70	59
2½ to 6, lap	77	68½	1¼, lap	54	43
			1½, lap	65	54
			2, lap	66	56
			2½ to 4, lap	68	59

Butt Weld, extra strong, plain ends

⅛, ¼ and ⅜	68	57½	⅜	63	52
½	73	66½	½	67	60
¾ to 1½	77	70½	¾ to 1½	71	62
2 to 3	78	71½	2 and 2½	72	63

Lap Weld, extra strong, plain ends

2	74	65½	1½	65	59
2½ to 4	76	67½	2	66	58
4½ to 6	75	66½	2½ to 4	70	61
7 to 8	68	57½	4½ to 6	69	60
9 to 12	63	52½	7 to 8	63	53
			9 to 12	58	47

Butt Weld, double extra strong, plain ends

½	63	56½	½	57	49
¾ to 1½	66	59½	¾ to 1½	60	52
2 to 2½	68	61½	2 and 2½	62	54

Lap Weld, double extra strong, plain ends

2	64	57½	2	55	49
2½ to 4	66	59½	2½ to 4	60	54
4½ to 6	65	58½	4½ to 6	59	53
7 to 8	58	47½	7 to 8	52	42

To the large jobbing trade an additional 5 and 2½ per cent. is allowed over the above discounts.

The above discounts are subject to the usual variation in weight of 5 per cent. Prices for less than carloads are two (2) points lower basing (higher price) than the above discounts on black and three (3) points on galvanized.

Boiler Tubes.—Discounts to jobbers, in carloads, in effect from May 1, 1914, on steel and from January 2, 1914, on iron, are as follows:

Lap Welded Steel		*Standard Charcoal Iron*	
1¾ and 2 in.	62	1½ in.	45
2¼ in.	59	1¾ and 2 in.	49
2½ to 2¾ in.	65	2¼ in.	45
3 and 3¼ in.	70	2½ to 2¾ in.	54
3½ to 4½ in.	72	3 and 3¼ in.	57
5 and 6 in.	65	3½ to 4½ in.	60
7 to 13 in.	62	5 and 6 in.	49

Locomotive and steamship special charcoal grades bring higher prices.

2½ in. and smaller, over 18 ft., 10 per cent. net extra.

2¾ in. and larger, over 22 ft., 10 per cent. net extra.

Less than carloads will be sold at the delivered discounts for carloads, lowered by two points for lengths 22 ft. and under to destinations east of the Mississippi River; lengths over 22 ft., and all shipments going west of the Mississippi River must be sold f.o.b. mill at Pittsburgh basing discount, lowered by two points. On standard charcoal iron tubes for desirable orders the above discounts are shaded an extra 5, and occasionally two 5's by some makers.

Sheets.—Makers' prices for mill shipment on sheets of U. S. Standard gauge, in carload and larger lots, on which jobbers charge the usual advance for small lots from store, are as follows, f.o.b. Pittsburgh, terms 30 days net or 2 per cent. cash discount in 10 days from date of invoice:

Blue Annealed Sheets	Cents per lb.
Nos. 3 to 8	1.30
Nos. 9 to 10	1.35
Nos. 11 and 12	1.40
Nos. 13 and 14	1.45
Nos. 15 and 16	1.55
Box Annealed Sheets, Cold Rolled	
Nos. 10 and 11	1.45 to 1.50
No. 12	1.45 to 1.50
Nos. 13 and 14	1.50 to 1.55
Nos. 15 and 16	1.55 to 1.60
Nos. 17 to 21	1.60 to 1.65
Nos. 22 and 24	1.65 to 1.70
Nos. 25 and 26	1.70 to 1.75
No. 27	1.75 to 1.80
No. 28	1.80 to 1.85
No. 29	1.85 to 1.90
No. 30	1.95 to 2.00

Galvanized Sheets of Black Sheet Gauge

	Cents per lb.
Nos. 10 and 11	1.75 to 1.80
No. 12	1.85 to 1.90
Nos. 13 and 14	1.85 to 1.90
Nos. 15 and 16	2.00 to 2.05
Nos. 17 to 21	2.15 to 2.20
Nos. 22 and 24	2.30 to 2.35
Nos. 25 and 26	2.45 to 2.50
No. 27	2.60 to 2.65
No. 28	2.75 to 2.80
No. 29	2.90 to 2.95
No. 30	3.05 to 3.10

Pittsburgh

PITTSBURGH, PA., June 30, 1914.

An order just issued by the Pennsylvania Railroad Company for the building of 84 locomotives at its Juniata shops, Altoona, Pa.—15 per month from July to November and 9 in December—and the buying of 5000 kegs of spike by a Western road from a local maker indicate that buying by the railroads is not entirely absent, although nearly so. It is claimed that the amount of business in finished steel products placed in June was fully 25 per cent. heavier than in May. Several pipe makers state that actual orders taken in June were nearly 50 per cent. larger than in May, and the sheet mills also showed an increase. Tin plate and sheets are now probably more active than most other finished lines. This week the American Sheet & Tin Plate Company is operating to 96 per cent. of its hot tin-mill capacity and 63 per cent. in sheets, a decided gain in the latter, and some of the other sheet makers report they are running at a higher rate than for some time. There is an improved feeling in the trade and a firm belief that business in the last half of the year will be better than in the first half, although not much improvement in prices is looked for.

Pig Iron.—The local pig-iron market is more active than for some months. The Standard Sanitary Mfg. Company has bought 5000 tons of Northern No. 2 foundry for its North Side and New Brighton, Pa., works and about 3000 tons of Nos. 2 and 3 Southern foundry for its Louisville, Ky., works. Part of the Northern iron is said to have gone at $13.75, delivered, from furnaces that have a 75c. freight rate. The Wheeling Mold & Foundry Company has closed with Hickman, Williams & Co. for about 35,000 tons of foundry iron to cover its contract for segments for the East River tunnel. It is said the price is on a sliding scale basis, moving up or down with the general foundry market. The Standard Steel Works Company, Philadelphia, recently bought 6000 tons of basic iron from a local interest, deliveries being 1000 tons a month, commencing July. This iron is to run 0.20 in phosphorus or under, and for this reason a better price was obtained for it than would otherwise have been the case. A sale of 1500 tons of Bessemer iron was made for delivery in last quarter to a local steel casting concern at $14, Valley furnace. Inquiries are out for 5000 to 6000 tons of Bessemer. A local interest reports sales for delivery over third quarter and last half of upward of 65,000 tons of basic at $13 and higher, Valley furnace. It is claimed that the basic market is firmer than for some months. W. P. Snyder & Co. report the average price for basic iron in June as $13 and Bessemer $14, Valley furnace, the same as for May. Prices are fairly strong. We quote Bessemer at $14; basic, $13; malleable Bessemer, $13 to $13.25; Northern No. 2 foundry, $13 to $13.50, and gray forge, $12.75, all at Valley furnace, with a freight rate of 90c. a ton for Cleveland or Pittsburgh delivery.

Billets and Sheet Bars.—It is stated that some contracts for sheet bars for third-quarter delivery have been adjusted to the basis of about $20, maker's mill, Youngstown or Pittsburgh. However, some consumers of sheet bars, whose contracts are based on pig iron on a sliding scale, will get their sheet bars for the third quarter at somewhat under $20, maker's mill. Little steel is being sold in the open market on new orders, as consumers are covered by contracts, and most of them have been getting steel faster than they can use it for some time, and have accumulated good stocks. We quote Bessemer and open-hearth billets at $19 to $19.50, and Bessemer and open-hearth sheet bars at $20 to $20.50, f.o.b. maker's mill, Pittsburgh or Youngstown districts. We quote forging billets at $25 for desirable orders of one size and up to but not including 10 x 10 in., regular extras being charged for larger sizes. On carload orders forging billets are held at $25. We quote axle billets at $23 for desirable orders and $24 for small lots, f.o.b. Pittsburgh.

Ferroalloys.—Little is doing in ferroalloys in this market, most consumers being covered over all of this year on both ferromanganese and ferrosilicon, and in some cases into next year. Sales of two carloads, or about 60 tons, of ferromanganese have been made for prompt shipment at $37.50, Baltimore, and three carloads of ferrosilicon at the full price of $73, delivered. We quote 50 per cent. ferrosilicon, in lots up to 100 tons, at $73; over 100 tons to 600 tons, $72; over 600 tons, $71, delivered in the Pittsburgh district. On 10 per cent. ferrosilicon the quotation is $19; 11 per cent., $20, and 12 per cent., $21, f.o.b. cars Jackson County, Ohio, or Ashland, Ky., furnace. We quote 20 per cent. spiegeleisen at $25 at furnace. We quote ferrotitanium at 8c. per lb. in carloads; 10c. in 2000-lb. lots and over, and 12½c. in less than 2000-lb. lots.

Muck Bar.—We quote best grades nominally at $27, f.o.b. Pittsburgh, no sales having been reported in this market for some time. A number of mills in the Central West that roll muck bar close down to-day (Tuesday) partly for repairs and also because the Amalgamated scale for puddling and finishing mills has not been settled.

Structural Material.—Inquiries have been light and several fabricators claim that work is going at such low prices they are about as well off without it. The contract for 1400 tons of steel for the Telegraph-Gazette building in this city, that was first placed with the American Bridge Company, has since been given to the Fort Pitt Bridge Works, the first named interest not being able to make the deliveries wanted. Work is expected to start soon on some new county buildings in this city that will require 12,000 to 15,000 tons of steel, but it will be some months before bids on the steel will be asked. The Riter-Conley Mfg. Company has taken 400 tons for a new building in this city for the Fidelity Title & Trust Company, and the Riverside Bridge Company has taken 1450 tons for new shops for the Cleveland Railways Company, at Cleveland, 525 tons for a building for Stone & Thomas at Wheeling, W. Va., and 200 tons for an addition to the plant of the King Sewing Machine Company. We quote beams and channels up to 15 in. at 1.10c. for desirable orders and prompt shipment, and 1.15c. on small orders, f.o.b. Pittsburgh.

Plates.—New car orders have been light. The Pressed Steel Car Company has taken 462 ventilated box cars and 45 miscellaneous passenger cars for the Seaboard Air Line, 25 more ore cars for Phelps, Dodge & Co., and 25 ore cars for the Lake Champlain & Moriah Railroad. Active inquiries include 800 cars for the Erie, 500 box and automobile cars for the Delaware, Lackawanna & Western, and 1000 gondolas and 1000 box cars for the Toledo & Ohio Central. The current demand for plates is quiet, and the mills are not running to over 50 per cent of capacity. A local interest has placed with the Carnegie Steel Company 8000 to 10,000 tons of plates for oil tank and other work, mostly in the West. We quote ¼-in. and heavier plates at 1.10c. to 1.15c., f.o.b. Pittsburgh.

Steel Rails.—Nothing official is known here of the reported rail orders placed by the Pennsylvania Railroad. Apart from 25,000 to 30,000 tons bought from the Pennsylvania and Cambria steel companies the road has asked bids on 100,000 tons additional. The new demand for light rails is fair, but the traction and mining companies are not placing orders freely. We quote light rails rolled from billets as follows: 25, 30, 35, 40 and 45 lb. sections, 1.10c.; 16 and 20 lb., 1.15c.; 12 and 14 lb., 1.20c., and 8 and 10 lb., 1.25c., in carload lots, f.o.b. Pittsburgh. For large lots these prices might be shaded.

Steel Wheels.—No orders of moment have lately been placed. We quote 33-in. engine truck wheels at $21; 36-in. engine truck wheels, $22; 33-in. tender

wheels, $17; 36-in. passenger and tender wheels, $19 to $19.50; 33-in. freight car wheels, $14.50 to $15, f.o.b. Pittsburgh.

Skelp.—It is said there is more new inquiry for skelp than for some time, due to the increase in demand for pipe, but all the mills that roll skelp are still badly in need of orders. We quote: Grooved steel skelp, 1.15c. to 1.20c.; sheared steel skelp, 1.20c. to 1.25c.; grooved iron skelp, 1.50c. to 1.55c.; sheared iron skelp, 1.60c. to 1.65c., delivered to consumers' mills in the Pittsburgh district.

Wire Rods.—There is very little new buying, as consumers whose contracts expire June 30 covered during the month for their needs for last half of the year. The mills report that specifications against contracts are quiet. We quote Bessemer, open-hearth and chain rods at $24.50 to $25, f.o.b. maker's mill, Pittsburgh, prices depending on desirability of the order.

Iron and Steel Bars.—It is stated that the amount of new buying in June for third quarter and last half of the year delivery was larger than generally supposed. The new demand for iron bars is dull, but for steel bars for reinforcing purposes is very active, a local maker having booked an order for close to 3000 tons in the past week. We quote steel bars at 1.10c. for desirable orders and prompt shipment, and 1.12½c. to 1.15c. for third quarter delivery. We quote iron bars, made nearly entirely from muck bar, at 1.25c. f.o.b. maker's mill, Pittsburgh. Regular extras for twisting reinforcing steel bars over the base price are as follows: ¾-in. and over $1; ½ to 11/16-in., $1.50; under ½ in., $2.50 per net ton. These extras are not always observed.

Sheets.—The market on sheets has shown some betterment, both in new demand and specifications. Practically all the sheet makers are refusing to sell at present low prices for delivery beyond third quarter, and some state they are limiting shipments to 60 days from date of order. We quote Nos. 9 and 10 blue annealed sheets at 1.35c.; No. 28 Bessemer black, 1.80c. to 1.85c.; No. 28 galvanized, 2.75c. to 2.80c.; No. 28 black plate, tin mill sizes, H. R. and A., 1.85c.; Nos. 29 and 30, 1.90c. The above prices are in carload lots, f.o.b. Pittsburgh, jobbers charging the usual advances for small lots from store.

Tin Plate.—Several of the larger makers of tin plate report a falling off in specifications in June as compared with two or three previous months, but this was due in part to the fact that some consumers had already specified for the entire amount of tin plate they will need this year and were urgent for prompt shipments. The leading tin-plate mills are operating to practically full capacity, and are well covered with orders over the next several months. A few of the mills are not running to more than 60 to 75 per cent. of capacity. There is not much new buying and only in small lots to cover current needs. We quote 100-lb. 14 x 20 coke plates at $3.30 to $3.40 and 100-lb. 14 x 20 terne plates at $3.20 to $3.30, f.o.b. Pittsburgh.

Shafting.—Makers report that specifications against contracts are only fair and have not shown any marked increase. However, one maker received larger specifications last month than in any one month for some time. The new demand and specifications for shafting do not represent more than 35 to 40 per cent. of capacity. We quote cold-rolled shafting in carload and larger lots at 65 to 66 per cent. off, and in small lots at 63 to 64 per cent. off, delivered in base territory. On a very desirable order for prompt shipment probably 67 per cent. off would be named.

Spikes.—A local interest has taken an order from the Illinois Central Railroad for 5000 kegs of spikes to be shipped out promptly. This is the only large contract placed in this market for some time. The new demand is quiet and only for small lots, but almost invariably railroads insist on prompt shipment, showing that their stocks are low. We quote standard sizes of railroad and boat spikes at $1.40 and small railroad and boat spikes at $1.50 per 100 lb. in carload lots, f.o.b. Pittsburgh.

Merchant Steel.—One leading maker reports that its new orders and specifications in June showed a slight increase over May, but new demand is only fair and mostly for small lots to meet current wants. Specifications against contracts for seasonable steels are fair. Prices are more or less shaded, depending on the order and deliveries wanted. On small lots for prompt shipment we quote: Iron finished tire, ½ x 1½ in. and larger, 1.30c., base; under ½ x 1½ in., 1.45c.; planished tire, 1.50c.; channel tire, ¾ to ⅞ and 1 in., 1.80c. to 1.90c.; 1⅛ in. and larger, 1.90c.; toe calk, 1.90c. to 2c., base; flat sleigh shoe, 1.65c.; concave and convex, 1.70c.; cutter shoe, tapered or bent, 2.20c. to 2.30c.; spring steel, 1.90c. to 2c.; machinery steel, smooth finish, 1.70c. We quote cold-rolled strip steel as follows: Base rates for 1 in. and 1½ in. and wider, under 0.20 carbon, and No. 10 and heavier, hard temper, 3.25c.; soft, 3.50c.; coils, hard, 3.15c.; soft, 3.40c.; freight allowed. The usual differentials apply for lighter sizes.

Wire Products.—Makers state that the new demand is dull. While contracts have been pretty well taken out, few new ones are being made. It is understood the leading interest will maintain a differential of 15c. per keg in prices on wire nails in the Birmingham, Ala., district, as against Pittsburgh. For instance, when the price of wire nails is $1.50, Pittsburgh, the price f.o.b. Birmingham will be $1.65 base per keg. Prices are fairly strong, but to some points in the South delivered prices are being made by Ohio River mills that figure back less than $1.50, Pittsburgh, the mills in question absorbing part of the freight. We quote wire nails, $1.50 to $1.55; plain annealed wire, $1.30 to $1.35; galvanized barb wire and fence staples, $1.90 to $1.95; painted barb wire, $1.50 to $1.55, all f.o.b. Pittsburgh, actual freight added to point of delivery, terms 30 days net, less 2 per cent. off for cash in 10 days. We quote steel cut nails at $1.55 to $1.60 f.o.b. Pittsburgh.

Nuts, Bolts and Rivets.—Makers of nuts and bolts report that quite a large number of contracts have been placed by consumers for nuts and bolts for third quarter and also for last half of the year, prices ruling about the same as for second quarter. Competition is keen, and in some cases discounts are shaded by a few makers. The new demand for rivets has been better the past week, one maker stating that he is running practically full for the first time in some months. We quote button-head structural rivets in carload lots at 1.50c., and in small lots at 1.60c.; cone-head boiler rivets, 1.60c. in carload lots, and 1.65c. in small lots, with terms 30 days net, 2 per cent. for cash in 10 days. Discounts on nuts and bolts are as follows in lots of 300 lb. or over, delivered within a 20c. freight radius of maker's works:

Coach and lag screws	80 and 5% off
Small carriage bolts, cut threads	80% off
Small carriage bolts, rolled threads	80 and 5% off
Large carriage bolts	75 and 5% off
Small machine bolts, cut threads	80 and 5% off
Small machine bolts, rolled threads	80 and 10% off
Large machine bolts	75 and 10% off
Machine bolts, c.p.c. & t nuts, small	80% off
Machine bolts, c.p.c. & t nuts, large	75 and 5% off
Square h.p. nuts, blanked and tapped	$6.30 off list
Hexagon nuts	$7.20 off list
C.p.c. and r sq. nuts, blanked and tapped	$6.00 off list
Hexagon nuts, ⅝ and larger	$7.20 off list
Hexagon nuts, smaller than ½ in.	$7.80 off list
C.P. plain square nuts	$5.50 off list
C.P. plain hexagon nuts	$5.90 off list
Semi-fin. hex. nuts, ½ in. and smaller,	85, 10 & 10% off
Semi-fin. hex. nuts, ⅝ in. and larger	85 & 5% off
Rivets, 7/16 x 6½, smaller & shorter	80, 10 & 5% off
Rivets, tin plated, packages	80, 10 and 5% off
Rivets, metallic tinned, packages	80, 10 and 5% off
Standard cap screws	70, 10 and 10% off
Standard set-screws	75, 10 and 10% off

Standard Pipe.—New orders for standard steel and iron and line pipe in June were much better than in May, several leading manufacturers reporting an increase of close to 50 per cent. The new demand for line pipe for gas and oil projects is heavy. The National Tube Company has taken 30 miles of 12-in., 25 miles of 16-in., 5 miles of 20-in., and 30 miles of 6-in., all for gas lines, and 170 miles of 10-in. for an oil line. Discounts on both iron and steel pipe are being well held.

Boiler Tubes.—The new demand for boiler and merchant tubes is only fair and discounts continue to be more or less shaded.

Coke.—The local market is quiet, but a large amount of blast furnace coke is under negotiation for

delivery over last half of the year, and part of it is expected to be closed this week. A local interest has sold 9000 tons of furnace coke per month for delivery over second half of the year at $2 per net ton at oven, making a total of 27,000 tons per month it has sold for this delivery. The coke runs low in sulphur and usually commands 10c. to 15c. per ton above the regular market. There is not much new demand for foundry coke, and prices are only fairly strong. We quote standard makes of furnace coke for prompt shipment at $1.75, and on contracts for delivery over last half $1.85 to $2 per net ton at oven. We quote standard makes of 72-hr. foundry coke at $2.30 to $2.50 per net ton at oven, the higher price being obtained for the very best grades. The output of coke in the upper and lower Connellsville regions for the week ended June 20 as reported by the Connellsville Courier, was 262,575 net tons, an increase of 2960 tons over the previous week.

Old Material.—The local scrap market is showing some signs of getting better, one or two large consumers that have bought but little for six months now being willing to take in limited amounts if they can get the right prices. A fair tonnage is moving in heavy steel scrap, borings and turnings, but the other grades are quiet. Prices are fairly strong, and some dealers are not making much effort to sell, believing the market will shortly be better. Dealers quote, per gross ton, for delivery to consumers' mills in the Pittsburgh and nearby districts that take the same rates of freight as follows:

Selected heavy steel melting scrap, Steubenville, Follansbee, Brackenridge, Sharon, Monessen, Midland and Pittsburgh delivery	$12.00
Ordinary steel melting scrap	$11.50 to 11.75
Compressed side and end sheet scrap	11.00 to 11.25
No. 1 foundry cast	11.50 to 11.75
No. 2 foundry cast	10.25 to 10.50
Bundled sheet scrap, f.o.b. consumers' mills, Pittsburgh district	8.50 to 8.75
Rerolling rails, Newark and Cambridge, Ohio, Cumberland, Md., and Franklin, Pa.	12.75 to 13.00
No. 1 railroad malleable stock	11.00 to 11.25
Railroad grate bars	10.25 to 10.50
Low phosphorus melting stock	14.25 to 14.50
Iron car axles	22.50 to 23.00
Steel car axles	15.50 to 16.00
Locomotive axles, steel	20.00 to 20.50
No. 1 busheling scrap	10.25 to 10.50
No. 2 busheling scrap	7.25 to 7.50
Machine shop turnings	7.75 to 8.00
Old carwheels	11.25 to 11.50
Cast-iron borings	8.25 to 8.50
†Sheet bar crop ends	12.00 to 12.25
Old iron rails	13.75 to 14.00
No. 1 railroad wrought scrap	11.50 to 11.75
Heavy steel axle turnings	8.50 to 8.75
Heavy breakable cast scrap	12.00 to 12.25

†Shipping point.

Chicago

CHICAGO, ILL., July 1, 1914.—(*By Wire.*)

The buying of steel for early shipment last week and during the entire month of June shows that the necessity for taking care of immediate requirements has become more general and urgent. However an apparently complete lack of confidence still checks buying into the future. That the third quarter will see a fair volume of specifying, including the placing of some rail orders for late summer track work, is the expectation, but no general forward movement of the market is anticipated. Although the railroads will have passed into a new fiscal year in the third quarter, and might be expected to buy more freely on that account, they have also passed the period when equipment can be purchased for service this fall. Steel orders booked last week exceeded those of a number of weeks previous largely because of the placing of car steel. This business was about equally divided between shapes and plates and leaves still to be purchased no very important quantity of material. Two railroad bridges now in the hands of engineers will call for about 20,000 tons of steel. Market conditions with relation to prices are unchanged from the status of a week ago. The most spectacular decline, perhaps, is that of bar iron, which would be more significant if the volume of going business were larger. The implement interests have never been more backward in arranging their annual programmes. In pig iron, buying for the third quarter appears to have been completed and current inquiry is largely for last quarter delivery. Mill operating schedules for July will probably show some lengthening of the customary shutting down period, but no protracted idleness is likely.

Pig Iron.—Except for some tentative inquiries involving fair amounts, pig-iron trading in the past week was uneventful. The tonnage carried over from the first half by so many melters is the probable explanation of the very limited buying for third-quarter shipment. Purchases for this delivery appear to be very nearly at an end and the inquiry now in the market very largely represents fourth quarter requirements. The advantage of price in this market continues to rest with local iron as against Southern brands and a number of sales of high-phosphorus iron from Northern furnaces is reported. Consumers' statements point in a number of instances to purchases of Southern iron on the basis of $10, Birmingham. A number of sales at $10.25 are also reported. The following quotations are for iron delivered at consumers' yards, except those for Northern foundry, malleable Bessemer and basic iron, which are f.o.b. furnace and do not include a local switching charge averaging 50c. a ton:

Lake Superior charcoal	$15.75 to $16.75
Northern coke foundry, No. 1	14.50 to 15.00
Northern coke foundry, No. 2	13.75 to 14.25
Northern coke foundry, No. 3	13.50 to 14.00
Southern coke, No. 1 f'dry and 1 soft	15.10 to 15.35
Southern coke, No. 2 f'dry and 2 soft	14.60 to 14.85
Malleable Bessemer	14.00 to 14.25
Standard Bessemer	17.00
Basic	13.25 to 13.50
Low phosphorus	21.00 to 21.75
Jackson Co. and Ky. silvery, 6 per cent.	16.90 to 17.40
Jackson Co. and Ky. silvery, 8 per cent.	17.90 to 18.40
Jackson Co. and Ky. silv'y, 10 per cent.	18.90 to 19.40

(*By Mail*)

Rails and Track Supplies.—The local market offers nothing new in the direction of rail purchases of such importance as to warrant note. There has been a little business in spikes and bolts but scarcely anything worthy of comment. We quote standard railroad spikes at 1.50c. to 1.55c., base; track bolts with square nuts, 1.90c. to 2c., base, all in carload lots, Chicago; tie plates, $25.50 to $26, f.o.b. mill, net ton; standard section Bessemer rails, Chicago, 1.25c., base; open hearth, 1.34c.; light rails, 25 to 45 lb., 1.25c.; 16 to 20 lb., 1.30c.; 12 lb., 1.35c.; 8 lb., 1.40c.; angle bars, 1.50c., Chicago.

Structural Material.—Plans are now being prepared for two large railroad bridges—one at Paducah, Ky., to require about 16,000 tons and another for the Keokuk & Hamilton Bridge Company at Keokuk, Iowa, from 3000 to 4000 tons. Car purchases in June totaled about 20,000, of which a substantial proportion are being built in the West. Further inquiries include 1500 for the Wabash and 2000 for the Toledo & Ohio Central, while the Illinois Central is understood to be negotiating for 30,000 tons of underframes, delivery of which will extend over a period of years. Contracts closed last week include 727 tons to the Morava Construction Company, for the Harris-Emery store, Des Moines, Iowa; 350 tons to Milliken Bros., for the San Diego Electric Company; 750 tons to the Central Iron Works, for a hotel building at San Francisco; 470 tons to the Omaha Structural Steel Company, for a Colorado River bridge at Yuma, Ariz.; 274 tons to the American Bridge Company, for a Salinas River bridge at Paso Robles, Cal.; 100 tons to the Baker Iron Works, for the Western Metal Supply Company, San Diego, Cal.; 101 tons to the Northwest Steel Company, for highway bridges at Astoria, Ore.; 669 tons for a power house at Thompson Falls, Mont., and 124 tons for a Southern California Edison Company transmission line. The contract of largest tonnage for the week covers 1150 tons for the Mail and Express Building of the Great Northern Railway Company, Minneapolis, Minn., awarded to the Milwaukee Bridge Company. Current orders are in very moderate volume only. We continue to quote for Chicago delivery of shapes from mill, 1.28c.

Iron and steel jobbers continue to report a situation in the demand for plain material out of store quite in contrast to the inactive buying from mill. We quote for Chicago delivery from store 1.75c.

Plates.—Although the buying of cars during the last month in this territory has been fairly satisfactory in number, but few of them have been of a type calling for the use of many plates in their construction. In consequence the local mills are as hungry for business as at any time. We quote for Chicago delivery from mill, 1.25c. to 1.28c.

We quote for Chicago delivery of plates out of stock 1.75c.

Sheets.—The expected mill shut-downs during the first two weeks of July may inject into the market some influence toward strength. The mill at Indiana Harbor is expected to run practically continuously throughout July, but for the most part the outlook is for very light rolling schedules. Ther is some contracting for third-quarter delivery and in some cases $1 a ton above current prices is being secured for deliveries after August 1. Buying by such sheet users as are able to take in material at once which will not be used until some time later has promoted a fair volume of buying for prompt shipment. Prices are still exceptionally low. We continue to quote for Chicago delivery from mill: No. 10 blue annealed, 1.48c.; No. 28 black, 1.93c. to 1.98c.; No. 28 galvanized, 2.88c. to 2.93c.

We quote for Chicago delivery from store as follows, minimum prices applying on bundles of 25 or more: No. 10 blue annealed, 1.85c.; No. 28 black, 2.35c. to 2.45c.; No. 28 galvanized, 3.35c. to 3.45c.

Bars.—Having no occasion for taking any bars for early delivery and not being ready as yet to concede the mills' contention for a six months' basis for contracting, most implement manufacturers continue to show only an inquiring interest in the market. For miscellaneous uses there is some current buying of bars and upon these orders local mills are depending for their activity in the next few weeks. At least two of the Western bar-iron mills which have not provided for the adjustment of their wage scales will be down during the first half of July. It is likely that other makers whose operations have been intermittent at best will curtail them still more. It may thus be possible to accumulate enough orders to lift prices from the extreme minimums indicated by recent sales as low as 1c., f.o.b. mill. We quote for mill shipments as follows: Bar iron, 1c. to 1.10c.; soft steel bars, 1.28c.; hard steel bars, 1.25c. to 1.30c.; shafting in carloads, 65 per cent. off; less than carloads, 60 per cent. off.

We quote store prices for Chicago delivery: Soft steel bars, 1.65c.; bar iron, 1.65c.; reinforcing bars, 1.65c. base, with 5c. extra for twisting in sizes ½ in. and over and usual card extras for smaller sizes; shafting 60 per cent. off.

Rivets and Bolts.—The softness in rivet prices, which has been especially pronounced as applied to prompt shipment orders, seems to have extended in some instances to full third-quarter contracts. Our quotations for bolts have been purely nominal for some time, but in recognition of the increasing prevalence of low prices we have revised them. We quote from mill as follows: Carriage bolts up to ⅜ x 6 in., rolled thread, 85-5; cut thread, 85; larger sizes, 80-5; machine bolts up to ⅜ x 4 in., rolled thread, 85-10; cut thread, 85-5; larger sizes, 80-10; coach screws, 85-15; hot pressed nuts, square head, $6.60 off per cwt.; hexagon, $7.60 off per cwt. Structural rivets, ½ to ¼ in., 1.58c., base, Chicago, in carload lots; boiler rivets, 10c. additional.

We quote out of store: Structural rivets, 2.20c.; boiler rivets, 2.30c.; machine bolts up to ¾ x 4 in., 75-15; larger sizes, 70-10-10; carriage bolts up to ¾ x 6 in., 75-10; larger sizes, 70-15 off; hot pressed nuts, square head, $6, and hexagon, $6.70 off per cwt.

Cast-Iron Pipe.—The business of the past week has been entirely routine in character, including a fair tonnage of gas pipe and some conduit pipe for railroad construction. No municipal lettings of importance are noted. We quote as follows, per net ton, Chicago: Water pipe, 4 in., $26; 6 to 12 in., $24; 16 in. and up, $23.50, with $1 extra for gas pipe.

Wire Products.—The wire trade may be estimated as reduced to approximately 50 per cent. of a normal volume of business. This quietness is chargeable in large measure to the season. Manufacturers are showing a disposition to contract, and in fact the present basis of prices is much more acceptable to the consumers than it is to the mill. The attention of the trade has been called recently to the new facilities for manufacture and distribution of wire and wire products from Birmingham where a stock of all grades is now accumulated. We quote to jobbers as follows: Plain wire, No. 9 and coarser, base, $1.53; wire nails, $1.68 to $1.73; painted barb wire, $1.68 to $1.73; galvanized, $2.13 to $2.18; polished staples, $1.68 to $1.73; galvanized, $2.03 to $2.08, all Chicago.

Old Material.—The scrap market atmosphere reflects a more pronounced depression this week. Following the limited activity that centered around the monthly purchase of the leading melter of heavy steel, there seems to be a more prevalent appreciation of the fact that old material values will not be permanently enhanced until a substantial buying of new material has been inaugurated. This fact is emphasized by the existence of heavy stocks of scrap on the yards of both melters and dealers. The scrap is coming into the market from makers and railroads very slowly, the only railroad lists unsold in this market being one from the Chicago & Northwestern of 4500 tons and one from the Great Northern of 1400 tons. The former list includes 500 tons of No. 1 cast and 1000 tons of old steel rails. The Baltimore & Ohio has out a blank inquiry for prices. We quote, for delivery at buyers' works, Chicago and vicinity, all freight and transfer charges paid, as follows:

Per Gross Ton

Old iron rails	$12.25 to $12.75
Old steel rails, rerolling	11.50 to 11.75
Old steel rails, less than 3 ft.	10.50 to 10.75
Relaying rails, standard section, subject to inspection	22.00 to 23.00
Old carwheels	11.25 to 11.50
Heavy melting steel scrap	9.75 to 10.00
Frogs, switches and guards, cut apart	9.75 to 10.00
Shoveling steel	9.25 to 9.50
Steel axle turnings	6.75 to 7.25

Per Net Ton

Iron angles and splice bars	$12.00 to $12.25
Iron arch bars and transoms	12.00 to 12.50
Steel angle bars	8.75 to 9.25
Iron car axles	16.25 to 16.75
Steel car axles	12.00 to 12.25
No. 1 railroad wrought	9.00 to 9.25
No. 2 railroad wrought	8.75 to 9.00
Cut forge	8.50 to 8.75
Steel knuckles and couplers	9.00 to 9.50
Steel springs	9.25 to 9.75
Locomotive tires, smooth	9.50 to 9.75
Machine shop turnings	5.00 to 5.50
Cast borings	4.50 to 5.00
No. 1 busheling	7.50 to 7.75
No. 2 busheling	6.00 to 6.25
No. 1 boilers, cut to sheets and rings	6.50 to 7.00
Boiler punchings	9.25 to 9.75
No. 1 cast scrap	9.75 to 10.25
Stove plate and light cast scrap	8.75 to 9.00
Grate bars	8.50 to 8.75
Railroad malleable	9.00 to 9.25
Agricultural malleable	8.00 to 8.25
Pipes and flues	6.50 to 7.00

Philadelphia

PHILADELPHIA, PA., June 30, 1914.

With consumers of materials and finished products persisting in their willingness to anticipate their needs in a manner satisfactory to producers, the latter continue to have but little cause for encouragement. With the customary Fourth of July shut-down, and two warm months at hand, the general feeling is that the iron and steel trade will have to worry along for at least 60 days without much increase in activity. In some cases eastern Pennsylvania mills will shut down all of next week and possibly for a longer period. Some pig-iron sellers, but they are in the minority, did a better business last week, the others finding the demand slack. All are hoping for a betterment after the holiday, but they do not expect a rush. Not only have orders for finished steel products been rushed to the mills by telephone, as seldom before, but work is being spread out to keep all branches in operation so far as possible. Bars show improvement, June having been the best month since February, and the prospects are for better business. Plates continue to be called for in good volume by a current run of small orders, but the future must take care of itself. Against the few cheering symptoms,

however, is the fact that shapes, sheets, billets and old material are moving poorly in this district, billets being especially dull. Prices generally have resisted declines, though the bulk of business is done at the lower ranges.

Iron Ore.—The market continues to lack interest. Importations of the week ended June 27 were 6300 tons from Africa, 11,300 tons from Cuba and 6688 tons from Sweden.

Pig Iron.—The business of the week has been irregular, with a minority of the sellers reporting some betterment. All agree that the general sales in June will considerably outweigh those of May, not including, of course, the big transaction in basic in the latter month. The flurry of a week or 10 days ago has subsided and conditions are now pretty much what they were before, with an absence of sales and inquiries of satisfying magnitude. The transactions which were closing in the week include 250 tons of Virginia No. 3 and 600 tons of Virginia No. 2, both at $13 furnace, for prompt delivery; 500 tons of Virginia No. 2 at $12.75 furnace, 300 tons of Virginia special analysis iron at $13.50 for third quarter; 400 tons of Pennsylvania No. 2 X to a stove works at the full price; 25 tons of Buffalo iron at $15.45; 1200 tons of charcoal iron at the full price, a carload of Lehigh No. 1 at $15.50 and a car of No. 2 at $15.45. A soil-pipe and fittings manufacturer at Hainesport took 400 tons of No. 2 plain, and there were other sales of equal importance with those referred to. Pipe iron has been quiet. Virginia iron has held better interest, one seller having sold 2700 tons in several lots at quoted prices for third-quarter delivery. Though June sales will show an increase over May, shipments will not, and Virginia furnace stocks will be slightly increased at the end of the month. Prices are well maintained, the only exception spoken of being an alleged case of splitting a commission to secure an order. A sale is reported of No. 2 Southern foundry at $10.50 for third-quarter delivery at a point outside this district. From New England there has come some inquiry for high silicon iron. In basic little or no interest has been shown, but a few lots of standard low phosphorus have been taken at ruling prices and at least 700 tons of Lebanon low phosphorus at $17.50, furnace. An Eastern steel mill has taken an order for 450 tons of steel-car castings for the Weimer Machine Works, Lebanon, Pa. The prices of all grades of iron adhere more closely to the lower figure of the range, which is about as follows for standard brands delivered to buyers' yards in this territory:

Eastern Penna. No. 2 X foundry	$14.75 to $15.00
Eastern Penna. No. 2 plain	14.50 to 14.75
Virginia No. 2 X foundry	15.55 to 15.75
Virginia No. 2 plain	15.30 to 15.55
Gray forge	13.75 to 14.00
Basic	14.00
Standard low phosphorus	20.50 to 21.00

Ferroalloys.—Business appears to be entirely absent, with no more call for carloads than for larger lots. The quotation for 80 per cent. ferromanganese is unchanged at $38, seaboard, for both English and German. Ferrosilicon, 50 per cent., remains at $71 to $73, Pittsburgh, according to quantity. Importations here last week were 100 tons of ferromanganese from England and 50 tons of ferrosilicon from Sweden.

Bars.—Some good business in steel bars is in course of negotiation, one maker having prospects in view, principally railroads, whose requirements will total about 40,000 tons. June has been a better month in sales than any since February. Most of the current orders are not large, but there are more of them and the total general buying is of correspondingly increased volume. Makers quote 1.25c. to 1.30c., Philadelphia, with the lower price given only where the business is sufficiently inducive, while for small lots and for third quarter the higher price is asked. Concrete bars are moving better than they were a month ago. Iron bars continue at 1.17½c. to 1.20c., Philadelphia. A better tendency has been felt, but the market is still quiet.

Structural Material.—Conditions show but little change in this territory and mills are not operating at much over 50 per cent. of capacity. The Guernsey-O'Meara Company, which secured the general contract for a building for the Pennsylvania Sugar Refining Company, has placed the order for the steel and its erection with the American Bridge Company. About 800 tons is required. Price & McLanahan, architects, Philadelphia, are asking for bids, which must be submitted by July 8, for between 750 and 1000 tons of column cores and reinforcing steel which are to be used in an extension to the Hotel Traymore at Atlantic City. The Pennsylvania Railroad has placed orders for small bridges involving a few hundred tons. The price range is unchanged at 1.25c. to 1.30c., with the bottom price more prevalent, for Philadelphia delivery.

Plates.—Orders continue small and miscellaneous in character, but are coming along in sufficient volume to keep mills in this territory operating at about 70 to 75 per cent. of capacity. Makers ask 1.30c., Philadelphia, for the general run of small business, and this price is asked also where third-quarter contracts are concerned, but for good prompt business 1.25c. is done. The Carpenter-O'Brien Lumber Company, Jacksonville, Fla., has ordered a 360-ft. lumber vessel from the New York Shipbuilding Company.

Billets.—Merchant business is practically at a standstill in this district, makers being unwilling to follow the decline to $19, Pittsburgh. At the same time there is very little demand at any price. At least one maker would quote $21.90 for basic open-hearth rolling billets. Forging steel runs $4 to $5 a ton higher. Eastern Pennsylvania mills are making billets at about half their capacity or very little more, and mostly for their own use.

Sheets.—The hoped-for improvement in sheets has not materialized and the market is quiet at 1.50c. for No. 10 blue annealed. Operations are irregular and the Fourth of July shut-down may be prolonged, inasmuch as difficulty has been found in keeping operations under way until the end of this week.

Coke.—The month of June, and especially its latter part, has been good as regards the making of coke contracts. Quotations vary considerably, with foundry coke at from $2.50 to $2.75 per net ton at oven. Furnace coke ranges from $1.85 to $2, according to delivery specified. Freight rates to this city from the principal producing districts are as follows: Connellsville, $2.05; Latrobe, $1.85, and Mountain, $1.65.

Old Material.—Small sales have been somewhat more numerous and inquiry is a little better, but in view of the approaching shut-down, which may last all of next week or longer, not much business is anticipated until July is well along. In prices there has been no change. The market for delivery in buyers' yards in this district, covering eastern Pennsylvania and taking freight rates varying from 35c. to $1.35, per gross ton, is as follows:

No. 1 heavy melting steel	$10.50 to $11.00
Old steel rails, rerolling	12.00 to 12.50
Low phosphorus heavy melting steel scrap	14.00 to 14.50
Old steel axles	14.00 to 14.50
Old iron axles (nominal)	20.00 to 21.00
Old iron rails	15.00 to 15.50
Old carwheels	11.00 to 11.50
No. 1 railroad wrought	12.50 to 13.00
Wrought-iron pipe	9.25 to 9.75
No. 1 forge fire	8.00 to 8.50
Bundled sheets	8.00 to 8.50
No. 2 light iron	5.00 to 5.50
No. 2 busheling	8.00 to 8.50
Wrought turnings	7.75 to 8.25
Cast borings	8.00 to 8.50
No. 1 cast	12.00 to 12.50
Grate bars, railroad	8.00 to 8.50
Stove plate	8.50 to 9.00
Railroad malleable	9.00 to 9.50

Boston

BOSTON, MASS., June 30, 1914.

Old Material.—The market changes little. Dealers believe the general sentiment to be better, and are hoping to get tangible results after a little while. The great fire at Salem should bring out considerable scrap, especially the great textile plant of the Naumkeag Steam Cotton Company, though much of the material, largely machinery cast, may be too seriously burned to possess much value. Prices are unchanged. The quotations given below are based on prices offered by the large dealers to the producers and to the small dealers and collectors, per gross ton, carload lots, f.o.b. Boston and other New England points which take Boston rates from eastern Pennsylvania points. In comparison

with Philadelphia prices the differential for freight of $2.30 a ton is included. Mill prices are approximately 50c. a ton more than dealers' prices:

Heavy melting steel	$8.25 to	$8.50
Low phosphorus steel	13.75 to	14.75
Old steel axles	13.25 to	13.75
Old iron axles	21.25 to	21.75
Mixed shafting	12.00 to	12.25
No. 1 wrought and soft steel	9.00 to	9.25
Skeleton (bundled)	5.50 to	5.75
Wrought-iron pipe	7.50 to	7.75
Cotton ties (bundled)	6.00 to	6.25
No. 2 light	3.75 to	4.25
Wrought turnings	5.00 to	5.50
Cast borings	5.25 to	5.75
Machinery, cast	11.25 to	11.50
Malleable	8.00 to	8.25
Stove plate	7.75 to	8.00
Grate bars	5.25 to	5.50
Cast-iron carwheels	11.00 to	11.25

Cleveland

CLEVELAND, OHIO, June 30, 1914.

Iron Ore.—Two sales are reported aggregating 25,000 tons. Generally the market is lifeless and ore firms look for little improvement in the near future. Operations on the Lake Superior ranges are being further curtailed, work in some of the mines having been temporarily suspended during the week. A large number of miners are now out of work. Mine operators are taking advantage of present conditions to improve their organizations by weeding out inefficient workmen. An eastern Pennsylvania steel company recently purchased 100,000 tons of lake ore, but no other business is in prospect from the East at present. We quote prices as follows: Old range Bessemer, $3.75; Mesaba Bessemer, $3.50; old range non-Bessemer, $3; Mesaba non-Bessemer, $2.85.

Pig Iron.—The market is slightly more active, but there is no improvement in the demand in this immediate territory. A Cleveland interest sold during the week about 13,000 tons of foundry and malleable iron for shipment from Toledo to western Ohio, Indiana and Michigan points. Of this 7000 to 8000 tons was malleable and the remainder foundry. The largest lots were 4000 tons of malleable and 2000 tons of foundry. An Ohio locomotive builder has purchased 500 tons each of Northern and Southern foundry iron and some charcoal iron for the last half. It is understood that the leading sanitary interest which has just purchased 5000 tons of Northern and 2000 tons of Southern for July and August delivery will shortly make additional purchases of about the same amount. Cleveland furnaces which have been holding nominally to $14.25 for No. 2 foundry iron, delivered in Cleveland, have reduced their prices to $13.75 delivered for the last half. M. A. Hanna & Co. will blow out their Cherry Valley furnace at Leetonia July 4. This is the only one of this firm's four stacks in the Valleys and Ohio that is now being operated. Southern iron is firm at $10.25, Birmingham. We quote, delivered Cleveland, as follows:

Bessemer	$14.90
Basic	$13.75 to 13.90
Northern No. 2 foundry	13.75
Southern No. 2 foundry	14.60
Gray forge	13.50
Jackson Co. silvery, 8 per cent. silicon	17.55
Standard low phosphorus, Valley furnace	20.25

Coke.—Some foundry coke contracts are being placed for a 12 months' period from July 1, but quite a few foundries are holding off in the hope of getting lower prices. Furnace coke is inactive. We quote standard makes of foundry coke at $2.50 per net ton at oven for contracts. Good makes for spot shipment can be bought at $2.40. Furnace coke is held at $1.75 for spot shipment and $1.85 to $2 for contracts.

Finished Iron and Steel.—Some of the mills report a slight improvement in specifications, but generally there is little change in the situation. At least one mill is making steel bar contracts with the implement trade at 1.10c. for the third quarter and 1.15c. for the last quarter, but generally the quotation is 1.15c. for the last half and a number of the implement makers and mills have not been able to get together as yet on prices. For prompt shipment steel bars, plates and structural material are quoted at 1.10c. Both the open-hearth and finishing departments of the Upson Nut Company will close down July 3 for repairs. When their operation will resume will depend on business conditions. The local iron rolling mills will probably be shut down the greater part of July. In structural lines the Riverside Bridge Company, Wheeling, W. Va., has taken 1500 tons for new car shops for the Cleveland Railway Company. A fair volume of small structural work is coming out, but nothing is pending involving round tonnages. Ohio plate shops are figuring on some coaling piers in Panama that will require about 2000 tons of plates. An additional contract in connection with the Cleveland filtration plant calls for 500 to 600 tons of steel piling. Sheets are not active. The ruling prices are 1.80c. for No. 28 black, 2.80c. for No. 28 galvanized and 1.35c. for No. 10 blue annealed for prompt shipment. Bar iron is in light demand and is quoted at 1.20c. for Cleveland delivery. Warehouse prices are 1.80c. for steel bars and 1.90c. for plates and structural material.

Bolts, Nuts and Rivets.—While the general quotations for rivets for last half contracts are 1.50c. for structural and 1.60c. for boiler these prices have been shaded $1 a ton in some cases. Bolts are in light demand and prices are weak. Plants are running 40 per cent. or less of capacity. We quote discounts as follows: Common carriage bolts, ⅝ x 6 in., smaller or shorter, rolled thread, 80 and 5 per cent.; cut thread, 80 per cent.; larger or longer, 75 and 5 per cent.; machine bolts with h.p. nuts, ⅝ x 4 in., smaller or shorter, rolled thread, 80 and 10 per cent.; cut thread, 80 and 5 per cent.; larger or longer, 75 and 10 per cent.; coach and lag screws, 80 and 15 per cent.; square h.p. nuts, blank or tapped, $6.30 off; hexagon h.p. nuts, blank or tapped, $7.20 off; c. p. c. and t. square nuts, blank or tapped, $6 off; hexagon, ⅝ in. and larger, $7.20 off; 9/16 in. and smaller, $7.80 off; semi-finished hexagon nuts, ⅝ in. and larger, 85, 10 and 5 per cent.; 9/16 in. and smaller, 85, 10, 10 and 5 per cent.

Old Material.—A limited tonnage is being sold in small lots, turnings being more active than other grades. Prices are weak and mills are able to pick up small lots at prices lower than ruling quotations. Busheling is particularly inactive and weak. A local mill is in the market for heavy steel at $10.50. An embargo has been placed on scrap for the Brier Hill Steel Company in Youngstown and other mills in that city are out of the market. One mill that usually buys considerable scrap is now producing as much as it consumes. We quote, f.o.b. Cleveland, as follows:

Per Gross Ton		
Old steel rails, rerolling	$11.50 to	$12.00
Old iron rails	13.00 to	13.50
Steel car axles	15.00 to	15.25
Heavy melting steel	10.25 to	10.75
Old carwheels	11.25 to	11.50
Relaying rails, 50 lb. and over	23.00 to	25.00
Agricultural malleable	8.50 to	9.00
Railroad malleable	10.25 to	10.75
Light bundled sheet scrap	7.50 to	8.00
Per Net Ton		
Iron car axles	$18.00 to	$19.00
Cast borings	5.50 to	6.00
Iron and steel turnings and drillings	5.25 to	5.50
Steel axle turnings	6.75 to	7.25
No. 1 busheling, new	8.25 to	8.50
No. 1 busheling, old		8.00
No. 1 railroad wrought	9.50 to	10.00
No. 1 cast	10.50 to	10.75
Stove plate	7.50 to	8.00

Buffalo

BUFFALO, N. Y., June 30, 1914.

Pig Iron.—The increase in inquiry is considerable as compared with the last few weeks, and a fair volume of orders has resulted, aggregating a little over 10,000 tons. Good tonnages are still under negotiation. A few foundries report a slight improvement in business, but the majority heard from state that contracts now being placed are much below normal. The order to cover pig-iron requirements for the East River tunnel segments for which the New York Car Wheel Company has a contract has not yet been placed, but it is expected to be the latter part of this week. It will call for 45,000 tons of low-phosphorus grades or malleable iron. The week has shown no quotable change in prices and we continue last week's schedule as follows, f.o.b. furnace, for third quarter and last-half delivery:

No. 1 foundry	$13.50 to $14.00
No. 2 X foundry	13.00 to 13.50
No. 2 plain	13.00 to 13.25
No. 3 foundry	13.00
Gray forge	13.00
Malleable	13.00 to 13.50
Basic	13.50 to 13.75
Charcoal, regular brands and analysis	15.75 to 16.75
Charcoal, special brands and analysis	20.50

Finished Iron and Steel.—Business in bars, small shapes, structural material and plates, has been placed in fairly good volume although the majority of orders consist of small lots. Some producing interests are now declining to take business on the basis of 1.10c., Pittsburgh, believing that this price will shortly disappear. For small tonnage 1.15c. is obtained and only large and desirable specifications have been conceded lower prices. A good share of the business reported for the week was from manufacturers, for immediate consumption, such as machinery builders and wagon and automobile manufacturers, a smaller proportion being from the building trades. Such contracts as are being made in this district are confined to third quarter delivery at 1.15c., mills not being willing to load up to any great extent with forward delivery business at low prices. Considerable inquiry is coming from agricultural implement makers, and a number of propositions are pending, but comparatively few contracts have been closed as yet for this class of trade. Such contracts as are taken for fourth quarter are at $1 per ton advance over third quarter. The Buffalo agency of the leading interest has taken contract for about 1500 tons of steel sheet piling for Erie Barge Canal work. Bids are to be called for the latter part of this week for grain elevator and mills to be built by the Ralston Purina Company of St. Louis on the Nickel Plate Railroad in this city, requiring a considerable tonnage of reinforcing bars and some structural steel. Bids are to be advertised for by the department of public works, Buffalo, in about two weeks, for a bascule bridge over the Buffalo River at Abbott road, requiring about 1200 tons of steel, and bids have just been taken for steel for St. Mark's Roman Catholic Church, Buffalo, 100 tons. The Lackawanna Bridge Company, Buffalo, has the contract for 500 tons of steel for a powerhouse at Cohoes, N. Y., and the Rochester Bridge Company has the contract for two highway bridges in Hamilton County, Ohio, requiring 480 tons.

Old Material.—A freer movement of heavy steel is a feature of the market and several sales of good tonnages in turnings and borings have been made. In most other commodities transactions have been light and no change in prices has been made from those quoted last week. We therefore continue last week's dealers' selling prices as follows, per gross ton, f.o.b. Buffalo:

Heavy melting steel	$10.25 to $10.50
Low phosphorus steel	14.50 to 15.00
Boiler plate sheared	11.50 to 12.00
No. 1 railroad wrought scrap	10.50 to 11.00
No. 1 railroad and machinery cast	10.50 to 11.00
Old steel axles	12.75 to 13.25
Old iron axles	19.50 to 20.50
Old carwheels	10.50 to 11.00
Railroad malleable	9.75 to 10.00
Machine shop turnings	5.25 to 5.75
Heavy axle turnings	7.50 to 8.25
Clean cast borings	6.00 to 6.50
Old iron rails	13.75 to 14.00
Locomotive grate bars	8.50 to 9.00
Stove plate (net ton)	9.75 to 10.00
Wrought pipe	7.50 to 8.00
Bundled sheet scrap	6.25 to 6.50
No. 1 busheling scrap	8.25 to 8.75
No. 2 busheling scrap	5.75 to 6.25
Bundled tin scrap	10.50

Cincinnati

CINCINNATI, OHIO, July 1, 1914.—(*By Wire.*)

Pig Iron.—Before the end of the week two furnaces will blow out in the Hanging Rock district, and it is the avowed intention of another owner to suspend operations some time this month. If present plans are carried out, only one stack will be in operation there on August 1. This contemplated reduction in output has not yet had any effect on prices. Although only a nominal stock of iron is piled in furnace yards, as compared with previous years, the consumption has not kept pace with production; as a consequence, prices have declined to a point now considered by many authorities as being below the cost mark. The majority of foundries in this territory are taken care of for the next three months, and those that have not a supply of iron on hand or ordered are simply buying to fill immediate needs. Both inquiries and sales in this territory are gradually declining, but there is considerable business transacted involving small tonnages that does not come to light. In the larger contracts reported is one for approximately 1000 tons of Southern No. 2 foundry, booked by a Central Western manufacturer at $10.25, Birmingham, for shipment this year. A central Ohio melter is said to have bought 600 tons of foundry iron from a Lake furnace below the regular market price, but exact figures are not obtainable. The usual closing of nearby rolling mills for midsummer repairs will extend through July, and this has caused a let-up in the demand for basic, although there is little yet to be bought in this territory for this year's shipment. Malleable has taken on a little more activity, but the largest reported sale covers only 3000 tons for an Indiana melter. A new Indiana stovemaker expects to buy soon 800 tons of Southern foundry and 400 tons of Ohio silvery iron. Based on freight rates of $3.25 from Birmingham and $1.20 from Ironton we quote, f.o.b. Cincinnati, as follows:

Southern coke, No. 1 f'dry and 1 soft.	$14.00 to $14.50
Southern coke, No. 2 f'dry and 2 soft.	13.50 to 14.00
Southern coke, No. 3 foundry	13.00 to 13.50
Southern No. 4 foundry	12.50 to 13.00
Southern gray forge	12.00 to 12.50
Ohio silvery, 8 per cent. silicon	17.20 to 17.70
Southern Ohio coke, No. 1	15.45 to 15.95
Southern Ohio coke, No. 2	14.45 to 14.95
Southern Ohio coke, No. 3	14.20 to 14.45
Southern Ohio malleable Bessemer	14.45 to 14.95
Basic, Northern	14.45 to 14.95
Lake Superior charcoal	15.25 to 17.25
Standard Southern carwheel	27.25 to 27.75

(*By Mail*)

Coke.—It is reported that a few Jackson County furnace operators have bought some 48-hr. coke from Fairmount producers. Outside of this there has been very little 48-hr. coke sold in this part of the country. It is the announced intention of several furnace companies in the Hanging Rock district to close down this week, and of course they are making no contracts for future supply. Most of them have more than enough coke to keep their furnaces in operation for approximately three or four months in case they decide later to blow in again. There has been some improvement in contracting for foundry coke in this vicinity, but the majority of the business is from other than jobbing foundries. A number of foundries have been buying for future shipment, but the tonnage is not up to the standard for this season of the year. Connellsville 48-hr. brands are quoted from $1.75 to $1.90 per net ton at oven, but coke producers in both the Wise County and Pocahontas fields are asking more for furnace coke. On leading foundry grades the quotation is between $2.25 and $2.50 per net ton at ovens in all three districts. Most of the business now being done is at the direct solicitation of salesmen.

Finished Material.—Although there is a somewhat improved sentiment existing, new business is very scarce. Reports of mill agencies show that the total of shipments going forward during the month of June were much better than was anticipated two weeks ago. These specifications are on contracts and only a small proportion will augment warehouse stocks, but this cannot be considered as indicating any improvement in building operations requiring structural material, such as concrete reinforcing bars, plates and shapes. Competition on any business offered is close, but as far as known here mill prices have not been shaded to any considerable extent, although deliveries have probably been extended beyond the usual prompt shipment time. We continue our quotations on steel bars and small structural shapes at from 1.10c. to 1.12½c., Pittsburgh, with a slight advance on plates. Store prices on steel bars remain around 1.75c. to 1.80c. and on structural shapes 1.80c. to 1.85c.

Old Material.—The rolling mills in this vicinity are not buying any scrap and this has had a depressing influence on the market. Foundry consumption also is not up to the mark and as a consequence there are prac-

tically no standard quotations in this market at the present time. The question has resolved itself into an individual one between the buyer and seller on all material now being bought. The minimum figures given below represent what buyers are willing to pay for delivery in their yards, southern Ohio, and Cincinnati, and the maximum quotations are dealers' prices f.o.b. at yards:

Per Gross Ton

Bundled sheet scrap	$6.75 to	$7.25
Old iron rails	11.75 to	12.25
Relaying rails, 50 lb. and up	19.75 to	20.25
Rerolling steel rails	10.75 to	11.25
Melting steel rails	9.25 to	9.75
Old carwheels	10.25 to	10.75

Per Net Ton

No. 1 railroad wrought	$8.75 to	$9.25
Cast borings	4.50 to	5.00
Steel turnings	4.50 to	5.25
Railroad cast scrap	9.25 to	9.75
No. 1 machinery cast scrap	10.25 to	11.25
Burnt scrap	6.00 to	6.75
Old iron axles	16.75 to	17.25
Locomotive tires (smooth inside)	9.75 to	10.25
Pipes and flues	6.25 to	6.75
Malleable and steel scrap	7.25 to	7.75
Railroad tank and steel scrap	5.25 to	5.75

Birmingham

BIRMINGHAM, ALA., June 29, 1914.

Pig Iron.—The leading manufacturers continue to decline to become elated over the large sales of pig iron that have been made in this district since June 1. On the other hand, there are important furnace operators who express some satisfaction over sales and prospects. Sales certainly tided over those who largely participated, although there are accumulations which will require a long time to move, one interest having 90,000 tons on yards.

Sales in the past week were not so large as in the first three weeks of the month, one interest dropping to a total of 850 tons. The largest sales reported by any one operator totaled 10,000 tons, of which a quantity is said to have gone to the St. Louis district. It is reported that some Southern furnaces north of Birmingham have sacrificed their freight rate differential by selling on a Birmingham basis. Offers of $10 for Birmingham iron are still made and generally declined. Operators again express the fear that some of the iron recently bought was purchased by merchants to be held for speculation. There has been no increase in the Southern melt for some time, but Middle West business is still reported as elastic and holding out the prospect of increasing. Little is heard of any basis but $10.25 for third quarter and $10.50 for fourth quarter. Shadings of the former basis reported, when run down, seem to point to iron other than Birmingham district make or metal that is not strictly foundry. The output has been increased by the blowing in of a stack by the Woodward Iron Company. We quote, per gross ton, f.o.b. Birmingham furnace yards, for third and fourth quarters, as follows:

No. 1 foundry and soft	$10.75 to	$11.00
No. 2 foundry and soft	10.25 to	10.50
No. 3 foundry	9.75 to	10.00
No. 4 foundry	9.50 to	9.75
Gray forge	9.25 to	9.50
Basic	10.00 to	10.25
Charcoal	23.50 to	24.00

Cast-Iron Pipe.—The larger pipe manufacturers are in receipt of orders sufficient in the aggregate to keep the plants running on a 60 to 75 per cent. basis, but no large contracts have been recently secured. There is, however, prospect of an increase of business to Western points since the recent reduction in freight rates. The reduction to Sioux City, Neb., for example, is from $8.15 to $5.95 per ton. Sanitary pipe factories are doing fairly well. We quote, per net ton, f.o.b. makers' yards, as follows: 4-in., $20.50; 6-in. and upward, $18.50.

Coal and Coke.—The prospect is broadening. Coke is selling with some freedom, a limited quantity being offered. Some coke has gone to Pensacola, winning out over an offer from Virginia by a small margin. We quote, per net ton, f.o.b. ovens, as follows: Furnace coke, $2.75 to $2.90; foundry coke, $3 to $3.25.

Old Material.—There has been no activity in the scrap market for some time. Some additional stocks have been taken on by dealers in view of confidence in steel plant operations. Nominal quotations, per gross ton, f.o.b. dealers' yards, are as follows:

Old iron axles	$14.50 to	$15.00
Old steel axles	14.50 to	15.00
Old iron rails	13.00 to	13.50
No. 1 railroad wrought	10.00 to	11.00
No. 2 railroad wrought	8.50 to	9.00
No. 1 country wrought	9.00 to	10.00
No. 2 country wrought	8.00 to	9.00
No. 1 machinery cast	9.50 to	10.00
No. 1 steel scrap	8.00 to	8.50
Tram carwheels	9.50 to	10.00
Standard carwheels	10.50 to	11.00
Stove plate	8.00 to	8.50

San Francisco

SAN FRANCISCO, CAL., June 24, 1914.

The jobbing trade is feeling the usual summer curtailment in some lines, though the aggregate movement is quite well maintained. The general outlook is more encouraging, with greater activity in outside construction work, while the crops are turning out in excellent shape. Large single orders are still widely scattered, and no material increase is being made in merchants' stocks. Prices continue unsettled, and, while there is some anticipation of a firmer market, this has brought no general response from buyers.

Bars.—The principal business of late has been in reinforcing bars, for which a few large orders have been placed, while scattering inquiries promise a good tonnage. Competition, however, is close and prices are low. One of the largest recent sales was made by a local mill at a price said to be below 1.50c., and German reinforcing material, in round lots, is quoted at about 1.32c. or 1.34c., c.i.f., duty paid. The foreign market, however, seems to be getting into firmer condition. Local interests are endeavoring to maintain a price of about 1.75c. in the jobbing trade, but find difficulty in making sales at this figure. The movement of soft steel bars from store is limited, but fair for this season. Eastern bars in carload lots for water shipment are quoted at 1.65c. Belgian bars have been offered as low as 1.28c., but few if any have been sold here, buyers being suspicious of the quality. German soft steel bars are offered at about 1.35c. Merchants still have a considerable tonnage of the latter coming on old contracts, placed when prices were much higher, and they are unwilling to buy in the quantities necessary to obtain present prices. There is no uniformity in merchants' resale prices, which range from 1.80c. to 1.90c. for small lots.

Structural Material.—The only fabricating contract of any interest is the Merritt building at Los Angeles, about 1600 tons, placed with the Llewellyn Iron Works. Nothing important has come out in this city, awards being delayed on most of the recent inquiries, and local fabricators report little work under way. Figures are generally very low, and builders are disposed to shop more than usual. An award is expected on a 15-story hotel on Powell street, near Post, and a small job is coming up at Hyde and Sacramento streets. The general contract has been let for the Cory building, Fresno, and plans are ready for another small job in the same town. Bids have just been taken for the Belding block, Stockton, Cal. Foreign plain material is offered for shipment at about 1.56c., against about 1.67c. for domestic shapes for water, or 1.95c. for rail shipment. No large tonnage of foreign shapes is coming in, as local fabricators are not disposed to carry a heavy stock.

Rails.—Small orders for standard sections have been rather numerous for the last fortnight. Little progress is being made on projects of an important nature, but interurban and logging roads are making many small extensions. The tonnage of light rails is fair, but prices are very low. Foreign 8-lb. rails, duty paid, are quoted at about 1.60c., and it is said that some domestic interests have made prices which successfully compete with this figure.

Plates.—While further large inquiries are expected at any time, nothing of special importance has come out. The jobbing trade in some quarters is a little better but shows no real activity. There is a fair

buying movement among tank manufacturers and shipbuilders for current requirements, but little provision is being made for the future. Little, if any, progress has been made toward introducing foreign plates into this market, as German quotations have been found higher than domestic, while Belgian tank plates, though quoted at about 1.47½c., are regarded with suspicion.

Sheets.—The usual summer curtailment is noted in the jobbing trade, and, in the absence of last year's strong demand for irrigation supplies, business is very quiet. A few orders were placed by merchants early in the month, but since then orders have been small, and there is apparently no great desire to place contracts for extended delivery. Mill prices, however, show a little more firmness. No. 28 black sheets, which might have been obtained a few weeks ago on a basis of 1.75c., Pittsburgh, or lower, are now pretty generally held at 1.80c. and galvanized at 2.75c. Jobbing prices are unsettled, with no definite basis. As far as can be learned, no foreign sheets have been purchased for this market. Figures that have been quoted on the lighter gauges are too high, and the risk of water shipment is considered altogether too great. A price of about 1.70c. c.i.f., duty paid, has been quoted on German blue annealed, gauges 12, 14 and 16, but from all reports no business has resulted.

Standard Pipe.—Nothing further has developed in line pipe. Distributive business is hardly keeping up with last month, and the slight buying movement last reported has fallen off. Notwithstanding the quick delivery now obtainable, merchants' stocks are so depleted that they are constantly sending in orders for small shipments by wire.

Cast-Iron Pipe.—Corporation buying is of limited extent, and municipal inquiries are developing slowly. The town of Long Beach is taking bids on 2000 tons and Los Angeles is out for 250 tons. Nothing further has been heard of the San Diego project, but the inquiry will doubtless appear before long. Local prices are about $31.50 per net ton for 6-in. and larger; $33.50 for 4-in.; $1 extra for gas pipe.

Pig Iron.—Middlesbrough iron, for shipment on sailing vessel, is still quoted at $19.50 to $20, but the tonnage taken on contract so far has been rather disappointing. Foundries are said to be holding off in expectation of lower freight rates by the Panama Canal, but the opening of the canal is still delayed, and the prospect of shipments by that route is very indefinite. Current business is confined to the former narrow limits, requirements being light. A few small shipments have arrived lately, preventing any material reduction of stocks. Spot prices are too irregular for any definite quotations.

Coke.—Several good-sized shipments have reached this port lately, causing a little easier feeling in the spot market, though prices show no great reduction. Little business is now being taken for future delivery. German Syndicate coke for current loading is quoted at $10 per gross ton, and from yard, San Francisco, at $13 per net ton.

Old Material.—The scrap market is extremely sluggish, with only small scattering sales in any line. Cast-iron scrap is quoted at $16 per net ton; steel melting scrap at $6 to $7 per gross ton, and wrought scrap at about $5 to $6 per net ton.

St. Louis

ST. LOUIS, MO., June 29, 1914.

Pig Iron.—The approach of a holiday, the repair season and the semi-annual inventory period have contributed jointly to something of a cessation of the buying movement which started recently, but furnace representatives are in a more hopeful frame of mind than they have been and are anticipating activity by the middle of the coming month. Sales of the past week have been in small lots, running from 100 to 250 tons, with demand for immediate shipment. Inquiries outstanding at the close of business, aside from a number of small items, include one of 1000 tons of No. 2 Northern, one of 1000 tons of 8 per cent. silicon and one of 800 tons of No. 2 on which either Northern or Southern can apply.

Coke.—A number of good-sized contracts are reported as having been closed for the northern part of the St. Louis territory by the by-product sources of supply at Milwaukee which reached down farther than usual and made prices which the St. Louis agents could not meet. By-product coke stands at about $5.20 per net ton, delivered St. Louis.

Finished Iron and Steel.—The demand for finished material continues of the hand-to-mouth character, fabricators and contractors generally not desiring to commit themselves ahead to any extent, though they report that business continues coming out, keeping them fairly busy. The principal item of interest at present is the contract for the Dallas Terminal which will run into a large tonnage of both structural and reinforcing material. The award is anticipated daily. Standard steel rails show no activity, while light rails are in only limited request from the coal interests, the lumber firms taking none at all. Bars show the best condition of all the market and are in really fair demond. Track fastenings are rather slow. Crop reports are giving a better feeling to the trade.

Old Material.—The market presents a somewhat better tone as the result of the beginning of what promises to be a phenomenal harvest, and there is a general revision of prices, though the quotations as given are still really nominal, as actual figures in transactions depend upon the status of buyer and seller at the time of trading. Dealers, however, are beginning to believe that the bottom has been reached and there is evidence of a willingness to speculate. This attitude is aided by an opinion that there will be improvement in prices and in demand in July and August, particularly after the inventories and repairs are out of the way and actual business is faced. The lists out this week include 500 tons from the Vandalia, 8000 tons from the Baltimore & Ohio and 1500 tons from the Great Northern. We quote dealers' prices, f.o.b. St. Louis, as follows:

	Per Gross Ton	
Old iron rails	$11.00 to	$11.25
Old steel rails, rerolling	11.25 to	11.50
Old steel rails, less than 3 ft.	10.50 to	10.75
Relaying rails, standard section, subject to inspection	21.00 to	23.00
Old carwheels	11.00 to	11.25
No. 1 railroad heavy steel scrap	10.50 to	10.75
Shoveling steel	8.00 to	8.50
Frogs, switches and guards cut apart	10.50 to	10.75
Bundled sheet scrap	5.00 to	5.25
	Per Net Ton	
Iron angle bars	$10.00 to	$10.50
Steel angle bars	9.25 to	9.50
Iron car axles	16.75 to	17.25
Steel car axles	11.75 to	12.25
Wrought arch bars and transoms	11.00 to	11.50
No. 1 railroad wrought	8.00 to	8.25
No. 2 railroad wrought	8.00 to	8.25
Railroad springs	9.25 to	9.50
Steel couplers and knuckles	9.25 to	9.50
Locomotive tires, 42 in. and over, smooth	8.75 to	9.25
No. 1 dealers' forge	7.75 to	8.00
Mixed borings	4.00 to	4.25
No. 1 busheling	7.25 to	7.50
No. 1 boilers, cut to sheets and rings	5.75 to	6.25
No. 1 cast scrap	9.50 to	10.00
Stove plate and light cast scrap	8.25 to	8.75
Railroad malleable	8.00 to	8.25
Agricultural malleable	7.50 to	8.00
Pipes and flues	5.75 to	6.25
Railroad sheet and tank scrap	5.75 to	6.00
Railroad grate bars	7.25 to	7.50
Machine shop turnings	5.00 to	5.25

New York

NEW YORK, July 1, 1914.

Pig Iron.—The month of June ends with buying rather quieter than when it came in. It is to be remembered at the same time that some business is being closed every week that does not get any publicity and that, in fact, is little known beyond the buyer and the seller. In this district the largest business reported involved several thousand tons placed by a New Jersey manufacturer of furnace castings. This iron, it is believed, went entirely to eastern Pennsylvania furnaces at prices somewhat lower than the recent average. The inquiry of a manufacturer of sanitary pipe is still pending, representing 5000 tons and upward. There has been some New England buying, including several lots of 500 to 1000 tons. The Norfolk & Western Railroad, in addi-

tion to buying a round lot of Virginia iron, took several hundred tons of charcoal iron. One or two buyers supposed to be wanting foundry iron and having out specific inquiries have withdrawn from the market for the time being. In the Buffalo district $13 appears to be the usual price for No. 2 X in fairly large lots. Generally speaking, blast furnace stocks have increased. Foundries are taking deliveries at the schedule rate in some cases, while in others iron is being held up. Deliveries to Canadian foundries are not satisfactory to the furnaces, conditions across the border showing no general improvement. We quote Northern iron for tidewater delivery as follows: No. 1 foundry, $14.75 to $15; No. 2 X, $14.45 to $14.70; No. 2 plain, $14.25 to $14.50; Southern iron, $15 to $15.25 for No. 1 and $14.75 to $15 for No. 2.

Ferroalloys.—An inquiry for 300 tons of 80 per cent. ferromanganese is before the market, but otherwise business continues unusually dull, with scarcely any sales of even small lots. Quotations continue at $38, seaboard, for either the English or German product. The rumor that the price of 50 per cent. ferrosilicon has been reduced, as reflected in a recent sale of some 600 tons, could not be verified, and quotations are still reported to be $71 to $73, Pittsburgh, depending on the quantity involved.

Finished Iron and Steel.—Inquiries, especially in structural material, are reported considerably better for this week than for last, and June business was better than that of May, with prospects that July will develop a better volume than is usual for that month. The first half of the year closes with the feeling that the last half will see a turn for the better and a large volume of business. Prices remain persistently low, and recent fabricating contracts were at the lowest prices of the year. A report that a sale of some 800 tons of plates of desirable specifications was made at 1.05c., Pittsburgh, was both affirmed and denied. Some buyers, however, had been unsuccessful in placing business at that figure. Plates and structural material can still be bought at 1.10c., Pittsburgh, or 1.26c., New York, which is now considered to be the level of the market. Some implement company business in bars has been done at 1.15c., Pittsburgh, deliveries running to July 1, 1915. The American Bridge Company has taken the contract for an addition to the Bonwit-Teller Company's building, calling for 1900 tons; also a warehouse for the Pennsylvania Sugar Refining Company, Philadelphia; a garage on West Ninety-sixth street for Frederick G. Bourne, 250 tons, and a school building in Brooklyn, 200 tons. The Lackawanna Bridge Company is to build a public pier, No. 26, East River, for the Lackawanna Railroad. Dietrich Brothers, Baltimore, have been awarded contracts for a building for the Crown Cork & Seal Company, Baltimore, 200 tons, and also for an addition to the Fidelity Building, Baltimore, calling for 250 tons. The Pennsylvania Steel Company is to fabricate a bridge of 900 tons for the Pennsylvania Railroad, and the Virginia Bridge & Iron Company one for 100 tons for the Southern Railway, while the Riter-Conley Company is to build a 100-ton bridge for the Erie. It is reported that the inquiry for structural material for a coke plant in Buffalo, 1000 tons, has again become active, and that a market house for Newark, 1500 tons, is to be readvertised for bids. We quote mill shipments of steel bars at 1.12½c. to 1.15c., Pittsburgh, or 1.28½c. to 1.31c., New York; plates and structural shapes, 1.10c. to 1.15c., Pittsburgh, or 1.26c. to 1.31c., New York, and iron bars at 1.22½c. to 1.27½c., New York. For lots from store we quote iron and steel bars at 1.80c. to 1.85c., New York, and plates and shapes at 1.85c. to 1.90c.

Cast-Iron Pipe.—While new municipal lettings in this vicinity are few and unimportant, general inquiry is better and prospects favor a considerably increased volume of business. Prices are no higher. Carload lots of 6 in. continue to be quoted at $20.50 to $21 per net ton, tidewater.

Old Material.—Inventory time being at hand and many steel plants and rolling mills having arranged to close for repairs until some time in July, requests are being received by dealers to hold up shipments of scrap. Under the circumstances little new business is to be expected. The past week has been exceedingly quiet. The hopeful feeling expressed at the beginning of June has almost disappeared, and predictions of lower prices are being freely made. The following are dealers' quotations, per gross ton, New York:

Old girders and T rails for melting	$7.75 to $8.25
Heavy melting steel scrap	7.75 to 8.25
Relaying rails	21.00 to 21.50
Rerolling rails (nominal)	10.00 to 10.50
Iron car axles	17.00 to 17.50
Steel car axles	11.50 to 12.00
No. 1 railroad wrought	10.00 to 10.50
Wrought iron track scrap	9.00 to 9.50
No. 1 yard wrought, long	8.50 to 9.00
No. 1 yard wrought, short	8.00 to 8.50
Light iron	3.25 to 3.50
Cast borings	5.50 to 5.75
Wrought turnings	5.25 to 5.50
Wrought pipe	7.00 to 7.50
Car wheels	9.25 to 9.75
No. 1 heavy cast, broken up	10.25 to 10.75
Stove plate	7.50 to 8.00
Locomotive grate bars	6.00 to 6.25
Malleable cast	7.25 to 7.75

British Trade Still Quiet

American Bessemer Pig Offered, with America Inquiring for Low Phosphorus

(*By Cable*)

LONDON, ENGLAND, July 1, 1914.

The pig-iron trade is quiet. American Bessemer pig iron is being offered at 61s. ($14.83) c.i.f. Wales, while America is also inquiring for special low-phosphorus pig iron. Steel is generally quiet, with an easy tendency in foreign material. The German tube syndicate is reported to be provisionally arranged, and this is regarded as an important step toward strengthening the Steel Works Union. Receipts of tin plates at Swansea the past week were 133,000 boxes and shipments were 139,000 boxes, leaving stocks 129,139 boxes. The number of blast furnaces in operation in Scotland, Cleveland and Cumberland is 164, against 205 at the corresponding time last year. Stocks of pig iron in Connal's stores are 80,925 gross tons, against 81,925 tons a week ago. We quote as follows:

Tin plates, coke, 14 x 20, 112 sheets, 108 lb., f.o.b. Wales, 11s. 10½d. ($2.89).

The following prices are per ton of 2240 lb.:

Cleveland pig-iron warrants (Tuesday), 50s. 11½d. ($12.39), against 51s. 3d. ($12.47) a week ago.

No. 3 Cleveland pig iron, makers' price, f.o.b. Middlesbrough, 51s. 3d. ($12.47), against 51s. 9d. ($12.59) a week ago.

Hematite pig iron, f.o.b. Tees, 59s. ($14.35).

Sheet bars (Welsh), delivered at works in Swansea Valley, £4 10s. ($21.89).

Steel bars, export, f.o.b. Clyde, £5 15s. ($27.98), against £5 17s. 6d. ($28.59) a week ago.

Steel joists, 15-in., export, f.o.b. Hull or Grimsby, £5 10s. ($26.76), against £5 12s. 6d. ($27.37) a week ago.

Steel ship plates, Scotch, delivered local yards, £5 12s. 6d. ($27.37).

Steel black sheets, No. 28, export, f.o.b. Liverpool, £8 15s. ($42.58).

Steel rails, export, f.o.b. works port, £5 12s. 6d. ($27.37), against £5 15s. ($27.98) a week ago.

The following prices are per export ton of 1015 kilos, equivalent to 2237.669 lb.:

German sheet bars, f.o.b. Antwerp, 78s. ($18.98).

German 2-in. billets, f.o.b. Antwerp, 73s. ($17.75).

German basic steel bars, f.o.b. Antwerp, £4 2s. to £4 3s. ($19.95 to $20.19) for prompt shipment, and £4 4s. to £4 5s. ($20.43 to $20.67) for forward delivery, a reduction of 1s. (24c.) all round.

German joists, f.o.b. Antwerp, £5 2s. to £5 5s. ($24.82 to $25.55).

Freight rates from Antwerp to New York, Boston, Philadelphia and Baltimore, per 1000 kilos (2204 lb.), are about as follows: Billets, blooms and bars, up to 20 ft., 9s. to 10s. ($2.19 to $2.43). Iron and steel sheets, 11s. to 12s. 6d. ($2.68 to $3.04). Beams up to 30 ft., 12s. 6d. ($3.04).

German Prices Still Weak

Strenuous Efforts of Unorganized Manufacturers to Get Together

BERLIN, June 18, 1914.

The upward tendency in export prices has evidently come to an end and a weaker movement has set in. German steel bars are now sold, f.o.b. Antwerp, at prices ranging between 83 to 87 marks ($19.75 to $20.70) by different manufacturers, and they can be had of dealers at 83 marks. This latter figure evidently refers to the Luxemburg-Lorrain product, which is always considerably cheaper than bars made in the Rhenish-Westphalian district. The home price in the latter district is also rather weaker at 94 marks ($22.37), with 1½ per cent. discount. Reductions in Belgian export prices were also reported several days ago. Contracts for sheets at 100s. ($24.33) and heavy plates at 94s. ($22.87) are mentioned. A reduction of 10 francs ($1.93) a ton on steel blooms was reported from the northern district of France this morning.

Meetings are again in progress this week in connection with the negotiations for organizing the finished steel branches. Two days ago the wire-rod makers met, but they did not succeed in clearing away all difficulties, and another meeting will be held about the end of the month. It is reported that the representatives of the trade are firmly convinced that the organization will be perfected. The heavy plate manufacturers have also been in session; they discussed allotments, without, however, reaching an understanding, and an adjournment to July 17 was voted.

The bar manufacturers were in session yesterday, but they, too, did not succeed in completing their organization. It is understood that a fresh difficulty has arisen in the shape of a demand by the makers of open-hearth bars that they be given a preferred position as to prices in the new organization. The difference of views on this point, however, are not regarded as of such serious import as to endanger the negotiations. But other difficulties have appeared, inasmuch as some of the older establishments are also coming forward with demand for enlarged allotments for their recently increased producing capacity. The allotment demands in bars have jumped up till the total has now reached the high level of about 6,250,000 tons. Thyssen has just made one concession to the rest of the trade. After having last week declared that he would not take part in organizing the tubing trade till the fate of the other organizations was cleared up, he has now consented to meet the other tubing manufacturers for a conference to-morrow.

The bar manufacturers reached one important decision, namely, that their negotiations must be concluded before the end of July. If by that time the organization has not been perfected, the efforts to complete it are to be suspended altogether.

Metal Market

NEW YORK, July 1, 1914.

The Week's Prices

Cents Per Pound for Early Delivery

	Copper, New York			Lead		Spelter	
June	Lake	Electrolytic	Tin, New York	New York	St. Louis	New York	St. Louis
24	14.00	13.50	30.60	3.90	3.80	5.05	4.90
25	14.00	13.50	29.75	3.90	3.77½	5.05	4.90
26	14.00	13.50	30.10	3.90	3.77½	5.05	4.90
27	13.87½	13.50	30.25	3.90	3.77½	5.05	4.90
29	13.87½	13.40	30.37½	3.90	3.77½	5.05	4.90
30	13.87½	13.40	30.45	3.90	3.77½	5.05	4.90

Copper has declined in the absence of buying. Tin continues to hover around 30c., but strength is seen in the statistics. Lead is dull and weaker. Spelter shows a weaker tendency. Antimony is neglected at unchanged prices.

New York

Copper.—Consumers have not responded to lower prices and other inducements presented to them and the market is extremely dull; in fact, it is called stagnant. The producers brought their quotation for electrolytic down to 13.62½c., 30 days, delivered, or 13.50c. cash, New York, last week, but since then copper has been freely offered down to 13.40c., cash, New York, and even lower might be done, the quoted prices being almost entirely nominal. Lake copper has been equally as quiet, and while prime brands are quoted at 13.87½c., other grades are plentiful at 13.75c. The prices in London to-day were £60 18s. 9d. for spot and £61 11s. 3d. for futures, the spot quotation being 17s. 6d. ($4.26) stronger than yesterday. The exports last month reached the excellent amount of 32,927 tons, with one day more to add.

Tin.—This metal has shown more activity than any of the others. Last Thursday there were reports of heavy selling of small parcels with some 25-ton lots included, but there seems to be some mystery as to who the buyers and sellers were and doubts have been expressed that the business was as heavy as reported. On Friday it was extremely dull, but on Saturday several parcels were sold for July delivery at prices ranging from 30.20c. to 30.25c. Monday was dull again, but yesterday there were fair sales and more could have been sold had sellers been willing to let go. A good part of this buying was done by a leading dealer, probably to cover his July needs. The lowest price obtained was 30.40c. and the highest 30.50c., with the market closing at 30.55c. bid but with no sellers. Between 200 and 300 tons changed hands. To-day the market shows greater strength as the result of the favorable statistics. The total visible supply July 1 is 16,027 tons, as compared with 17,862 tons June 1, a decrease of 1835 tons, which to-day caused an advance of £2 10s. ($12.16) in London, where the spot quotation is £140 10s. and that for futures £142 5s. June deliveries in this country totaled 3650 tons and there is now in stock here 1358 tons. Arrivals in June were 3235 tons and there is afloat 2659 tons.

Lead.—The market is practically at a standstill, with 3.90c., New York, and 3.77½c., St. Louis, quoted. There evidently is more lead on hand than is needed and holders have tried hard to make sales at 3.77½c., St. Louis, but with no success. The sales made in May by the largest interest are reported as having been the heaviest in its history.

Spelter.—Extreme dullness prevails in spelter also, and its tendency is toward weakness. Refiners have heavy stocks on their hands which must be converted into money before long, making lower prices probable in the opinion of the trade. The New York quotation to-day is 5.05c. and that of St. Louis 4.90c., and possibly a little lower might be done.

Antimony.—No interest whatever is shown and prices continue unchanged with Cookson's at about 7c.; Hallett's, 6.75c.; Hungarian, 5.40c., and other grades, 5.40c. to 6c.

Old Metals.—Very little business is being done and quotations are only nominal. Dealers' selling prices are about as follows:

	Cents per lb.
Copper, heavy and crucible	12.75 to 13.00
Copper, heavy and wire	12.25 to 12.50
Copper, light and bottoms	11.50 to 11.75
Brass, heavy	8.50 to 8.75
Brass, light	7.00 to 7.25
Heavy machine composition	11.75 to 12.00
Clean brass turnings	8.50 to 8.75
Composition turnings	10.00 to 10.50
Lead, heavy	3.70
Lead, tea	3.40
Zinc scrap	3.85

Chicago

JUNE 29.—Trading in non-ferrous metals is of a desultory character and the market is soft and lacking in snap. Copper is inclined to be weak. We have revised our quotations and quote as follows: Casting copper, 13.75c.; Lake copper, 14c. for prompt shipment; small lots, ⅛c. to ¼c. higher; pig tin, carloads, 31c.; small lots, 33c.; lead, desilverized, 3.85c., and corroding, 4.10c., for 50-ton lots; in carloads, 2½c. per 100 lb. higher; spelter, 5c.; Cookson's antimony, 9.50c. for cask lots; other grades, 8c.; sheet zinc, $7, f.o.b. La Salle or Peru, Ill., less 8 per cent. discount in carloads of 600-lb. casks. On old metals we quote buying prices for less than carload lots as follows: Copper wire, crucible shapes, 11.25c.; copper bottoms, 10c.; copper clips,

10.50c.; red brass, 10.50c.; yellow brass, 7.25c.; lead pipe, 3.30c.; zinc, 3.50c.; pewter, No. 1, 23c.; tinfoil, 26c.; block tin pipe, 27c.

St. Louis

JUNE 29.—The week has been rather dull and there have been no marked fluctuations in prices. Lead is quoted at 3.77½c. to 3.80c.; spelter, 4.85c. to 4.90c.; tin, 30.75c. to 30.95c.; Lake copper, 14.37½c.; electrolytic copper, 13.85c. to 14.10c.; Cookson's antimony, 7.60c. to 7.72½c. In the Joplin ore district the effect of the shortage in the labor market, due to the harvest field demand, continued to be noticeable, curtailing production in some of the mines. The basis range for 60 per cent. metallic zinc was $39 to $41 per ton, with the choicest as high as $44. Calamine was steady at $22 to $23 for 40 per cent., with the choicest at $28. The Miami, Okla., district which has been a low grade camp has begun to show improvement and the top price brought there was $42.50 for choicest ores. Lead ore was fairly steady and the basis price for 80 per cent. was held at $46. Miscellaneous scrap metals are quoted as follows: Light brass, 5.50c.; heavy yellow brass, 7.50c.; heavy red brass and light copper, 9.50c.; heavy copper and copper wire, 10.50c.; zinc, 3c.; lead, 3.25c.; tea lead, 3c.; pewter, 21c.; tinfoil, 25c.

Iron and Industrial Stocks

NEW YORK, July 1, 1914.

The stock market was partly demoralized on Thursday, June 25, when announcement was made of the failure of the H. B. Claflin Company, of this city, probably the largest wholesale dry goods house in the world. Prices drooped for a few days subsequently, rallying on Tuesday of this week. Transactions in stocks were light, the volume of business on exchanges for several days having rivaled previous records for dullness. The range of prices on active iron and industrial stocks from Wednesday of last week to Tuesday of this week was as follows:

Allis-Chal., com..	10⅛- 10½	Pressed St'l, pref.	102⅝-103
Allis-Chal., pref..	41 - 42	Ry. Spring, com.	26¾- 28¼
Am. Can, com...	25¼- 27⅞	Republic, com...	22 - 22⅞
Am. Can, pref...	89½- 91⅞	Republic, pref...	84 - 85¼
Am. Car & Fdy., com.	49 - 51	Rumely Co., com.	9¼- 10
Am. Loco., com.	29⅞- 30	Rumely Co., pref.	25 - 26½
Am. Loco., pref.....	99¾	Sloss, com.....	26
Am. St'l F'dries.	29⅝- 30	Pipe, com.....	7¾- 9
Bald. Loco., com.	43 - 44	Pipe, pref.....	30 - 35
Bald. Loco., pref.....	107½	U. S. Steel, com..	58¾- 61¾
Beth. Steel, com.	40 - 42	U. S. Steel, pref.	108¾-109½
Beth. Steel, pref.	83 - 85¼	West'gh'se Elec..	73 - 75
Colorado Fuel...	25 - 27	Chic. Pneu. Tool.	53½- 53¾
Deere & Co., pref.....	93½	Cambria Steel...	47½- 48
General Electric.	146 -147⅞	Lake Sup. Corp..	16¼- 17
Gt. N. Ore Cert..	29½- 32	Pa. Steel, pref.....	62½
Int. Harv., com..	103¾-105⅞	Warwick	10
Int. Harv., pref.....	118	Cruc. Steel, com.	15¾- 16
Int. Harv., Corp.....	102	Cruc. Steel, pref.	89⅜- 90¼
Int. Pump, com...	3 - 4½	Harb. Wk. Ref., pref..	99
Int. Pump, pref..	11 - 11½	La Belle Iron, com.	29 - 30
Pressed St'l, com.	42 - 43⅞	La Belle Iron, pref.....	117

Dividends Declared

The Chicago Pneumatic Tool Company, regular quarterly 1 per cent. payable July 25.

The Westinghouse Electric & Mfg. Company, regular quarterly 1¾ per cent. on the preferred stock and 1 per cent. on the common stock, preferred dividend payable July 15, common payable July 30.

The American Locomotive Company, regular quarterly 1¾ per cent. on the preferred stock, payable July 21.

The Sharon Steel Hoop Company, regular quarterly 1¾ per cent., payable July 1.

The American La France Fire Engine Company, Inc., regular quarterly 1¾ per cent. on the preferred stock, payable July 1.

The American Screw Company, regular quarterly 1½ per cent., payable June 30.

The National Fire Proofing Company, regular quarterly 1 per cent. on the preferred stock, payable July 15.

For the third time since last fall the Chicago Steel Products Company has passed its quarterly 2 per cent. dividend.

The Pittsburgh Coal Company, regular quarterly 1¼ per cent. on the preferred stock, payable July 15.

Titanium and the Magnetic Properties of Iron

"The Effect of Titanium on the Magnetic Properties of Iron" is the subject of a bulletin prepared by Kenneth P. Applegate, and issued by the department of electrical engineering, Russell Sage laboratory, Rensselaer Polytechnic Institute, Troy, N. Y. Research was undertaken to ascertain the effect of titanium on the magnetic properties of iron and from these effects to determine the suitability of titanium as a means of lowering the hysteresis losses in iron. The present methods of reducing hysteresis in iron consist in making iron magnetically softer, accomplished either by adding foreign material or by annealing. The present low hysteresis irons are chiefly silicon and aluminum steels. Because of the comparatively low atomic weight of titanium it was thought that an alloy of titanium and iron might yield a metal having low hysteresis losses. In preparing the specimens the best grade of Swedish charcoal iron was used, to which titanium in varying forms and quantities was added and attended with considerable difficulty in some cases, especially when ferrotitanium was used. Melting the ingredients together in a vacuum furnace of the Arsem type gave most satisfactory results.

The main conclusions drawn from this work are as follows: Small amounts of pure titanium (less than 1 per cent.) decrease to a slight extent the hysteresis losses in pure Swedish charcoal iron. An increase in the percentage of titanium causes an increase in the hysteresis loss. Alloys of titanium and iron are not rendered appreciably softer by prolonged annealing at 760 deg. C. The commercial titanium alloys when dissolved in iron yielded a metal much poorer in magnetic quality than the alloys containing pure titanium. Titanium steels are not as good as the present standard silicon steels. Small amounts of pure titanium increase the permeability of pure Swedish charcoal iron.

Lake Superior Mining Institute

The meeting of the Lake Superior Mining Institute for 1914 will take the form of an excursion. Gathering at Ishpeming, Mich., August 31, the members will spend a day at Marquette range mines and will witness a first-aid exhibition in which all the ranges will be represented. Going to St. Ignace in the evening they will board a Detroit & Cleveland boat bound for Detroit. Business sessions will be held en route. Two days will be spent at Detroit, one of the trips being to the Ford automobile plant.

The Columbia & Knickerbocker Trust Company has filed a petition in the Federal District Court, New York, asking for a receiver of the Hudson Iron Company. The defendant company operates the Forest of Dean Mine, Fort Montgomery, N. Y., and owns the Secaucus blast furnace at Secaucus, N. J., which has not been in operation for several years. The plaintiff is a trustee of a mortgage for $1,000,000 on the iron mine and the Secaucus properties, securing an issue of 5 per cent. bonds. The petition alleges that the Hudson Iron Company defaulted on the interest and sinking fund installment due February 1, 1914.

The Cyclops Foundry Company, Monongahela City, Pa., expects to have its new foundry in operation early this month, the old one having been destroyed by fire January 2. The new plant is fully equipped for the manufacture of light and heavy machinery castings, blast-furnace castings and miscellaneous castings up to 15 tons in weight of gray iron or semi-steel. The foundry is housed in a building 76 x 175 ft., and the pattern shop is 30 x 40 ft. The foundry will have a capacity of 25 to 30 tons a day.

The Clipper Belt Lacer Company, Grand Rapids, Mich., on June 26 shipped a carload of No. 2 Clipper lacers and hooks to its European agents, Schuchardt & Schutte, Berlin, Germany. It was the company's first shipment abroad, the order having been placed through the efforts of W. K. Lee, who is spending some time in the Eastern hemisphere in the Clipper Company's interests.

CAST PIPE TRADE BAD

United States Cast Iron Pipe and Foundry Company Operating at a Loss

The United States Cast Iron Pipe & Foundry Company has issued its fifteenth annual report, covering operations for the year ended May 31, 1914. Results were unsatisfactory, showing a net loss for the year of $59,867.83. In consequence of this the directors have passed the declaration of the usual quarterly dividend on the preferred stock. The income account for the year is as follows:

Total earnings, after deducting cost of maintenance and operation of plants, expenses of sales and general offices and provision for taxes and doubtful accounts	$121,297.21
Other income, consisting of interest on bonds in treasury and sinking fund and other miscellaneous income	70,334.62
	191,631.83
Reserved for improvements and replacements	96,000.00
	95,631.83
Interest on bonds and bills payable	155,499.66
Net loss for the year	$59,867.83

The condensed balance sheet, as of May 31, 1914, is as follows:

Assets

Property and plant:		
To May 31, 1913	$24,986,730.90	
Net deduction during year arising from sale of property, etc.	245,067.25	$24,741,663.65
Treasury stock:		
4487 shs. preferred } at cost		347,555.00
4587 shs. common }		
Bonds of American Pipe & Foundry Company:		
Par value		
Treasury $242,000.00	$242,000.00	
Sinking fund 369,000.00	367,650.00	609,650.00
Current assets:		
Cash on deposit and on hand	$813,523.67	
Accounts and notes receivable	1,809,840.76	
Inventories of raw materials, manufactured product, etc.	2,591,864.68	5,215,229.11
Total		$30,914,097.76

Liabilities

Capital stock:		
Preferred	$12,500,000.00	
Common	12,500,000.00	$25,000,000.00
Bonded debt:		
American Pipe & Foundry Company	$1,500,000.00	
Dimmick Pipe Company	$179,000.00	1,679,000.00
Current liabilities:		
Accounts and bills payable	$1,898,315.16	
Accrued taxes, interest, etc.	73,894.44	1,972,209.60
Reserves:		
Improvements and replacements	$227,693.09	
Insurance	106,557.51	
Doubtful accounts	51,220.03	385,470.63
Surplus:		
Working capital reserve	$1,700,000.00	
Profit and loss account	177,417.53	1,877,417.53
Total		$30,914,097.76

The profit and loss account is as follows:

Balance May 31, 1913	$737,285.36
Loss for year to May 31, 1914	59,867.83
	$677,417.53
Less dividends on preferred stock, 4 per cent. paid out of profits of year to May 31, 1913	500,000.00
Balance May 31, 1914	$177,417.53

From the accompanying statement to the stockholders by President L. R. Lemoine the following extracts are taken:

Your company's business for the year has been unremunerative—because of low prices and severe competition for a business which in total volume amounted to less than half that needed for the available capacity of all makers. The recent trend of events affecting your business has been full of vicissitudes and uncertainties; and while low prices have been known before, the present unsatisfactory price markets have continued over a longer period, and business managers are in a more or less helpless condition regarding the use of any method for maintaining or advancing the price of their product.

That part of the body-politic, known as the business world, can hardly be said to have been seized with psycho-neurosis. Rather, the country seems to be involved in a cycle of unrest, distrust and suspicion; an utter "lack of confidence," hard to comprehend, but which nevertheless exists. This condition is not a mental illusion. It is caused by hard facts—which suggest a new bondage rather than a new freedom. What added difficulties to general trade conditions may develop it is impossible to forecast; but until "uncertainty" and "lack of confidence" evaporate, a return of normal conditions is unlikely.

Under such circumstances the wonder is your loss for the year is as small as it is. As the appended financial statement and balance sheet show, you end the year with a loss of $59,867.83 as compared with a surplus of $564,426.64 for the preceding fiscal year. Your loss is largely due to the factor of price; in addition to which the curtailment of business generally, resulting from economic changes and apprehension as to further pending legislation, has had a very direct effect upon the general business situation; and as applied to your industry, resulting in the severe competition of other makers, some of whom, it would seem have been selling their product far below the cost of production. That such economic waste should be forced by our beneficent government is indeed hard to understand; especially when we consider how enlightened nations abroad foster their industries by permitting reasonable co-operation of competitors; fair to them and fair to the public at large. Thus, under the law of supply and demand, friendly competition, that is co-operation which includes regulation of output and prices, should take the place of the ruthless competition which as now forced cannot mean anything but the "survival of the fittest"—a result which these very laws of our country were intended to prevent. Something like the co-operation permitted abroad must eventually obtain. Why should our government forbid by law those methods, which in all fairness and justice, are recognized as equitable in Germany and Great Britain, when they are not detrimental to the public? If we must have a Federal Trades Commission, may its powers be such that it can do for business what the Interstate Commerce Commission does for railroads in the avoidance of ruinous competition.

In the first quarter of the past fiscal year, at three of your plants you were recovering from loss and damage incident to the severe floods in the Ohio Valley; and much of your largest Ohio plant was closed owing to labor conditions, chiefly because of a molders' strike in the district, which extended to your works. With the second quarter the decrease in the volume of business made it difficult to keep your plants balanced; and the general conditions obtaining in the last six months are too well known to require comment.

The six plants now partially operated show a somewhat lower working cost per ton. In fact, even with the reduced tonnage, owing to greater efficiency, there would have been a material reduction in the cost per ton had there not been an increase in items over which you have no control; notably, for instance, the cost of accident insurance as affected by recent State laws. When, therefore, business conditions so improve that your works may be operated with a normal tonnage, your operating costs will bear favorable comparison. While plant efficiency will more and more obtain as you are able to carry out plans for centralization and modernizing of works, it is equally important that you should regularly obtain prices for your product which will bring a fair return. This, in fact, is the crux of the whole matter.

Your output for the past year is only approximately 30 per cent. less than for the year preceding. For the first half the volume of business decreased to the lowest point on record. For the second half, there was some improvement, but not sufficient to supply your several works with a normal tonnage; and your operations were, of necessity, so curtailed that for several months less than half your plant capacity was in work. Several of your works are now closed pending a return to better conditions. Some of them may not be re-opened as the policy of concentration which is being worked out, when accomplished, will notably reduce the number

of your active plants without decreasing your capacity, so that several of the less effective plants may ultimately be disposed of; while the larger tonnage per unit will result in lower costs and greater efficiency. You are now prepared, when the demand warrants, to produce in fewer works your maximum tonnage.

In spite of the unfavorable year your plants have been so operated that your stocks of unsold pipe are no larger than a year ago, and are of those sizes and classes usually most readily marketable.

Your directors desire to express their deep sense of the injustice of the general conditions from which your interests have suffered, and that because of them your company is compelled to pass its dividend. They are, however, confident of the future, and believe the sober sense of the American people will soon so assert itself that normal conditions will in due course obtain. Your interests are being conserved in every way possible, and it is hoped that the time is not far distant when your business may again earn such increment as will warrant a resumption of dividends. You, of course, have the interests of your company at heart and must, therefore, have noted the proposed legislation affecting business, which the directors of your company believe will further hamper them in their endeavor to make a fair profit upon your investment. Your business is directly affected. If you also agree that such legislation is unwise, and will further tend to upset business conditions, will you not make known your opinions to the Senators and Representatives from your States?

Failure of Amalgamated Conference

As a result of the failure of the wage committees of the Amalgamated Association and the sheet and tin-plate makers that sign the Amalgamated scales to come to an agreement, a number of sheet and tin-plate mills in the Central West closed down on Tuesday, June 30, pending a settlement of the scale and to make needed repairs. It is not believed that the shutdown will continue long as the Brier Hill Steel Company, Youngstown, Ohio, which has two large sheet mills at Niles, Ohio, signed the Amalgamated Association sheet scale and will continue to run. It is probable that other sheet and tin-plate makers, as soon as mill repairs are finished, will also sign the scale. Should another conference be held and any concessions be granted by the Amalgamated Association, all the makers that sign the scale prior to such conference will be allowed the benefit of the concessions.

The firm of Miller & Van Winkle, making a specialty of springs of crucible steel, music wire, brass, phosphor bronze, German silver and vanadium steel, Bridge, John and Plymouth streets, Brooklyn, N. Y., has been incorporated with a capital of $150,000. The business is one established in 1884 by William H. Miller and Nathaniel H. Van Winkle. For the past twelve years the active management has been carried on by Edward M. Miller, now president of the company, and Clarence L. Miller, secretary and treasurer, both of whom, with Gilbert P. Brush, are directors.

The brick and concrete construction on the new building of the Thief River Falls Iron Works, Thief River Falls, Minn., is practically completed and the work of installing the furnaces will start soon. When complete the foundry will be one of the most fully equipped plants in the Northwest outside of the Twin Cities. Besides doing all kinds of casting, the company will manufacture machinery and building material and will do welding and all kinds of flue work.

A rush export crane shipment is learned of from the Cleveland Crane & Engineering Company, Wickliffe, Ohio, which recently consigned a large gantry crane to the Australian Government at Sydney. The shipment was routed by way of the Nickel Plate and the Lackawanna and arrived at the docks in New York City 35 hr. after leaving the plant. The shipment was put through in this short time with wire tracer only.

BIRMINGHAM, ALA., CHOSEN

American Iron and Steel Institute Meeting October 29 and 30

The directors of the American Iron and Steel Institute, at their monthly meeting in New York Friday, June 26, decided to hold the autumn meeting of the Institute at Birmingham, Ala., on Thursday and Friday, October 29 and 30. With the new hotel accommodations that have been provided in Birmingham in the past year it is believed the members can be taken care of comfortably. The important construction of iron and steel and coke plants that has added to the capacity of that district in the past five or six years should make the inspection features of the meeting of peculiar interest. Youngstown, Ohio, also extended an invitation for the October meeting, and this makes it probable that the autumn meeting of 1915 or the year following will be held there.

New Members

At the directors' meeting of June 26 the following were elected to membership in the Institute:

ACTIVE MEMBERS

Charles E. Adams, president Cleveland Hardware Company, Cleveland.

Louis Jacob Affelder, assistant division contracting manager American Bridge Company, Pittsburgh.

James C. Alley, sales agent Eastern Steel Company, New York.

Harry B. Barren, superintendent blast furnace Inland Steel Company, Indiana Harbor, Ind.

Charles W. Brown, secretary Colonial Steel Company, Pittsburgh.

Frederick C. Brunke, manager United States Steel Products Company, Toronto, Canada.

Alonzo Lucas Conner, assistant manager Gulf States Steel Company, Alabama City, Ala.

Harry Austin Deuel, superintendent open-hearth department Colorado Fuel & Iron Company, Pueblo, Colo.

Frederick Henry Gerwig, assistant superintendent blast furnaces, Carnegie Steel Company, Braddock, Pa.

Erskine Hewitt, New York.

Samuel Kirtland Hine, general manager Girard Iron Company, Girard, Ohio.

Henry Phelps Howland, superintendent of blast furnaces, Wisconsin Steel Company, Chicago.

Dudley R. Kennedy, special agent Youngstown Sheet & Tube Company, Youngstown, Ohio.

Alexander S. Knowles, superintendent by-product coke ovens, Illinois Steel Company, Joliet, Ill.

L. R. Lemoine, president United States Cast Iron Pipe & Foundry Company, Philadelphia.

Howard Walter McAteer, comptroller Cambria Steel Company, Johnstown, Pa.

Edwin H. Peirce, bureau chief physical laboratories, American Steel & Wire Company, Worcester, Mass.

Alain D. dePierrefeu, metallurgical engineer Illinois Steel Company, South Chicago, Ill.

George E. Scott, first vice-president American Steel Foundries, Chicago.

F. W. Steinen, Corrigan, McKinney & Co., Cleveland.

Charles F. Stone, manager of sales Atlanta Steel Company, Atlanta, Ga.

Richard G. Wood, Jr., Alan Wood Iron & Steel Company, Conshohocken, Pa.

ASSOCIATE MEMBERS

M. C. Christie, president Otto Coking Company, New York.

George W. Cravens, C & C Electric & Mfg. Company, Garwood, N. J.

Edward Leslie Farrar, sales agent General Electric Company, Pittsburgh.

John Francis Fletcher, assistant to vice-president Harbison-Walker Refractories Company, Birmingham, Ala.

Philip Gensheimer, general superintendent, Goldschmidt Detinning Company, Chrome, N. J.

Elmer Kirkpatrick Hiles, secretary Engineers' Society of Western Pennsylvania, Pittsburgh.

Rukard Hurd, secretary Minnesota Tax Commission, St. Paul, Minn.

James Wesley Kinnear, vice-president Washington Steel & Ordnance Company, Pittsburgh.

Walter B. Lashar, president American Chain Company, Bridgeport, Conn.

Irvin Frank Lehman, treasurer and general manager Knox Pressed & Welded Steel Company, Pittsburgh.

Charles Noble Markle, president Texas Carnegie Steel Association, Galveston, Texas.

Charles Adams Post, president Standard Coupler Company, New York.

Charles Herbert Scammell, president Scammell Expanded Metal Company, New York.

Francis P. Sinn, superintendent Palmerton plants New Jersey Zinc Company, Palmerton, Pa.

Wilfred Sykes, electrical engineer Westinghouse Electric & Mfg. Company, East Pittsburgh, Pa.

Buckner Ashby Wallingford, Walter-Wallingford Company, Cincinnati.

A Method of Casting Billets

The Superior Pouring Metals Company has been formed at Johnstown, Pa., in the interest of a process which involves the employment of an apparatus for the casting of billets in molds. The object is one that has long been aimed at by a number of steel works inventors—the production of billets without the employment of the blooming mill. J. T. Rowley, Pittsburgh, is the inventor and the new company is composed of residents of Johnstown, the president being Charles R. Glock; the treasurer, Dr. W. W. Hoffman, and the secretary, E. T. Felt. Some of the billets made by the process at West Leechburg, Pa., were rolled at Johnstown. From a 4 x 4-in. section rounds 1 3/16 in. diameter were rolled, and the steel was drawn and subjected to other tests showing good quality. The method is thus described by one of the promoters of the process:

"The steel from the furnace passes into a ladle, which is then taken to the casting department, where it is poured into the distributers. From the distributers it passes into the molds. Underneath these molds, which are of any size desired, according to the orders being filled, are sets of rolls. The liquid steel first fills a pair of jaws, which, water cooled as they are, solidify the metal with great rapidity. When the necessary solidification has been complete in the billet the rolls seize the metal in the jaws of the mold and carry each billet away. These billets can then be rolled in the same heat to any size merchant steel; or they can be sheared, charged in a furnace and heated again."

American Car & Foundry Company's Report

The annual report of the American Car & Foundry Company for the year ended April 30, 1914, shows net earnings of $5,810,889, against $5,539,829 the previous year. The surplus, after the payment of the usual allowances for renewals, improvements and dividends on the preferred and common stock, was $1,057,971, against $628,593 the previous year. From the surplus $700,000 was appropriated for maintenance and improvements, against $250,000 the previous year. President F. H. Eaton states that the gratifying result of the past year is not to be ascribed altogether to improvement in general business, but to the fact that at the close of the previous year the company had contracts for cars sufficient to assure continuous operation for a number of months. He states that the cars under contract at the close of the year were appreciably less than at the close of the preceding period, but that since then there has been some improvement.

The Westinghouse Strike

Indications are now favorable for an early settlement of the strike at the plants of the Westinghouse Electric & Mfg. Company, Westinghouse Machine Company and Pittsburgh Meter Company at East Pittsburgh, Pa. A conference has been held between a committee of the strikers and E. M. Herr, vice-president of the Electric & Mfg. Company, that lasted about two hours, at which, it is said, developments were favorable and possibly this week the strike may be declared off. Nothing official has been given out, but it is understood that the Westinghouse interests will make some slight concessions to the men on certain points of difference and that the demands of the strikers when they went out will be materially modified.

PERSONAL

Thomas H. Mirkil, Jr., formerly general manager of the Southwark Foundry & Machine Company, Philadelphia, and for the past four years vice-president and general manager of the Poole Engineering & Machine Company, Baltimore, will represent Treadwell Engineering Company, Easton, Pa., in Philadelphia and vicinity, with offices in the Mutual Life Building, Tenth and Chestnut streets.

C. M. Means, electrical engineer, Pittsburgh, has been appointed consulting electrical engineer with the United States Bureau of Mines.

H. W. Green, who has been district sales agent for the American Steel Foundries in Pittsburgh for the past 10 years, has been elected second vice-president of the Lawrence Steel Casting Company, Pittsburgh.

Dudley A. Johnson succeeds the late Sam Mayer as Chicago branch manager of the Joseph Dixon Crucible Company. He has for a number of years been an assistant to Mr. Mayer at Chicago.

Frank M. Eaton, who has been resident partner and manager of the Cincinnati office of Hickman, Williams & Co. a number of years, has retired because of ill health. He is succeeded by Edward P. Hettiger, formerly of the company's Chicago office.

C. P. Perin, consulting engineer for the Tata Iron & Steel Company, who with B. D. Padsh, managing director, is now on the return trip to India, entertained a party of Chicago iron and steel men at lunch at the Chicago Club last week.

Robert J. Bailey has been made sales manager for the Henry A. Ross Company, Oliver Building, Pittsburgh, dealer in coal, coke and metal products. Mr. Bailey was formerly secretary of the Pittsburgh Coal Operators' Association.

James L. O'Neal, credit manager of the Carnegie Steel Company, Pittsburgh, made an address on "Observance of Sales Terms in Relation to the Unearned Discount Evil" at the annual convention of the National Association of Credit Men, June 24, at Rochester, N. Y.

J. C. Brady, son of the late A. N. Brady, at the annual meeting of the United States Cast Iron Pipe & Foundry Company, was elected a director to succeed his father. The other directors were re-elected.

J. Frater Taylor, president Algoma Steel Corporation, Ltd., sailed for Europe last week.

L. H. Shoemaker has been appointed division engineer, Pittsburgh division, of the American Bridge Company, succeeding Richard Khuen, Jr., transferred to the erecting department. Mr. Shoemaker was graduated at the University of Michigan.

Blowing Out Ohio Furnaces

A number of blast furnaces in the Central West are scheduled to blow out in the coming week. Cherry Valley furnace, of M. A. Hanna & Co., at Leetonia, Ohio, will be blown out July 4; Hamilton furnace, of the Hanging Rock Iron Company, Hanging Rock, Ohio, will blow out July 3, and Lawrence furnace in the same district, July 5. The one furnace of the Wellston Steel & Iron Company at Wellston, Ohio, now in blast, will probably be blown out early in August, and another furnace in the Hanging Rock district will go out about the same time. Jackson furnace, at Jackson, Ohio, is now idle for the installation of a skip hoist.

The National Gas Engine Association held its annual convention at the LaSalle Hotel, Chicago, June 24 to 26. The attention of the meeting was largely given to preparations for the annual gas engine show to be held at Toledo, Ohio, October 21 to 24. Among the addresses included in the programme was one by John Lind, on "Mobilizing the Business Man" and a paper on "Costs" by C. E. Bement, Novo Engine Company.

The Croxton Efficiency System

Details of the System Used by the American Pig Iron Association for Compiling Cost and Other Statistics

The work of the American Pig Iron Association, which has been referred to in *The Iron Age* in connection with the reports of some of its meetings, has developed statistical methods that are more than ordinarily interesting. The first general meeting of the association, held in New York late in April, directed attention particularly to the system in use for compiling information as to pig iron production, sales and relation of market prices to costs. What is designated as the Croxton Efficiency System, which was worked out by David T. Croxton, president of the Cleveland Furnace Company, represents a unique plan for securing statistics not generally available to members of such associations, and doing this with entire secrecy as far as individual returns are concerned.

"It may be said, in brief, that the returns of individual companies become the material out of which composite figures are made showing the cost of making iron in a given district for a month and the profit or loss on shipments made in the month, as well as on iron represented in new orders of the month. The individual figures are not seen by any officer of the association, but an adding machine is brought into requisition at the meetings, and thus the compilation is made in the presence of attending members. Anonymous slips are used, and each slip is destroyed as soon as the figures have been put on the machine. Thus totals and averages are made up and announced at the meeting and each member present carries away with him the composite record. The two blanks employed are reproduced in connection with this article, and complying with the request of *The Iron Age* Mr. Croxton has prepared the following explaining his system and its operation:

BASIS OF THE SYSTEM

"The value of the operation of this system is based on the following ideas:

"If all of the facts of an industry were known, and if they could be assembled in aggregate form without disclosing any of the personal affairs of any company, so that the results of the monthly operations of an industry, from a commercial, operating and safety standpoint could be thoroughly analyzed, studied and understood by all interested, better results would be obtained by that industry.

"Practical cost sheets and operating statements could be made for a whole business, or perhaps for districts and then afterwards compiled for the entire business. These cost sheets and operating statements could be made to cover all the activities of the business, and they would show what the industry as a whole was doing just as accurately as the individual cost sheets and operating statements of the various companies show what each is doing.

"It is not necessary to argue that complete monthly statements of financial and commercial transactions, with complete figures as to operations, accidents and irregular occurrences, have the greatest value in directing the judgment of the man in control of a company, so that costs may be reduced, the efficiency and safety of operations increased, and either profits increased or the price to the consumer reduced, leaving at the same time a proper result to the company.

COST VARIATIONS NOT FOLLOWED CLOSELY

"In a day when changing freight rates, assembling costs, raw material and labor costs, taxes and costs of accidents introduce so many variables, and when fires, floods, irregular car supply or shortage or inefficiency of labor are at times to be reckoned with, many manufacturers fail to make sufficient allowances for these changes or do not understand fully what they mean to their costs. They may at times think that they alone are subject to certain increases in the costs of manufacture, when all of their competitors are feeling to a greater or less degree the same effects. It is, therefore, believed that if the firms in an industry would co-operate in a complete study of the financial, operating and safety conditions of their business, they would be able to arrive at a better understanding of the aggregate and average results and of these uncertain factors which of recent years have been varying so greatly.

"It is well known that in the pig iron business ore prices frequently fluctuate 50 cents a ton, which makes a fluctuation of $1 a ton in the cost of pig iron. Those who are so fortunate as to be without ore when a reduction in price is made can immediately take advantage of it, but at such times a large majority have been forced to carry over heavy supplies of ore because of the declining volume of business, the very thing that brings about the reduction in the raw materials. It frequently occurs that violent fluctuations take place in coke prices.

The blanks prepared for the American Pig Iron Association provide means for showing the condition of the industry as a whole, and the effect of these varying elements is shown clearly in the monthly statement is worked out by this system.

HOW THE CROXTON SYSTEM IS WORKED

"The method of operating the system is very simple, as will appear from the blanks. For the present the results are the best obtainable from the different methods of accounting used by the various companies. It is hoped that a further study of this subject will lead to a greater uniformity of cost accounting, which, of course, will mean greater accuracy in the results obtained.

"The blank headed 'Confidential Figures' (Fig. 1) is composed of two parts. One part contains the information which a company representative at a meeting brings with him, and has on it simple instructions for bringing about in a simple way more or less uniformity in the accounting. The perforated coupons which are attached are filled out with the figures on the confidential memorandum, each coupon letter corresponding with that on the other side At the meeting the coupons are called for, one at a time, and the figures on them are added by the adding machine operator, the results reported and the coupons destroyed. Then the next one is called for, and so on down the list.

"In order to arrive at the cost for the district the total sum of coupons C is divided by the total tons made, which is the sum of coupons B, and the resultant average per ton cost is announced and

tabulated on the blank headed 'Recapitulation of Conditions' (Fig. 2). A glance at this blank shows clearly the headings which are to be filled out.

To be made out for each Furnace Company represented.

Croxton Efficiency System

CONFIDENTIAL FIGURES

To put in your pocket and bring to meeting.

To be kept in possession of Furnace Company Representative.

Figures to be used at meeting.....

Through Adding Machine.

For American Pig Iron Association. To determine General Averages only.

COST PER TON IRON MADE

COKE
If bought, charged at purchased price.
If made, charged at cost at furnace plant (preferable),
or charged to Furnace Dept. as on Company's books,
or at market price.

ORE
If purchased, charge at price delivered to furnace.
If mined, charge at cost at furnace (preferred),
or as charged to Furnace Dept. on Company's books,
or at market price.

STONE
To be charged by same method as ore.

OPERATIONS OF FURNACE
All costs of manufacture.
1-12 of total yearly Taxes and Insurance (estimated).
Relining fund of 25c per ton Iron.
Contingent fund of 5c per ton Iron.

No charge to be made *for Selling cost or commissions.*
" " " " " " *Depreciation.*
" " " " " " *Interest or Discount.*
" " " " " " *Bonds, Interest or Retirement.*
" " " " " " *Capital, Interest.* ..... A

Cost per ton Iron made during ..... *calculated as above.*

Total tons made during month Basic, Foundry, Malleable and off grades ..... B

Multiply tons made (B) by cost per ton (A) = ... C

Total tons unfilled orders on books ..... D

Average price per ton f. o. b. furnace unfilled orders on books first of ..... No deduction allowed *for selling cost or commissions* ..... E

Multiply tons (D) of unfilled orders by average price per ton at furnace(E) = ... F

Total tons sales made during month of ..... G

Average price per ton f. o. b. furnace.
No deductions for sales costs or commissions. ..... H

Multiply tons of sales (G) made by price per ton (H) = ... I

Total tons shipped during month of ..... J

Average price per ton f. o. b. furnace.
No deductions for sales costs or commissions. ..... K

Multiply tons shipped (J) by price per ton (K) = ... L

Stocks on hand ..... *1st* ..... tons. M

Based on expected operations under present conditions of market.
Estimated balance tons of iron to sell to ..... *1st* ..... tons. N

Total tons iron made during month of ..... tons. O
Pounds ore per ton iron ..... lbs.
Multiply iron made by lbs. ore per ton iron ..... P

Total tons iron made during ..... tons. R
Pounds coke per ton iron made ..... lbs.
Multiply iron made by lbs. coke per ton iron ..... lbs. S

Total tons iron made during ..... tons. T
Pounds stone used per ton iron made ..... lbs.
Multiply tons iron made by lbs. stone per ton ..... lbs. U

% yield in pig iron, actual V

% iron made per Company, above .05 Sul. ..... % W

Total No. accidents per Company X

No. deaths or total disability ..... Y

No. injured losing 2 arms, legs or eyes ..... Z

No. injured losing 1 arm, leg or eye ..... AA

No. minor injuries ..... BB

After the left half of blank is filled out, HAVE YOUR BOOKKEEPER REWRITE THE FIGURES corresponding to letters, in spaces below for your convenience in meeting.

Made B ..... tons.

Cost C
$

Unfilled orders D ..... tons.

Value F
$

Sales G ..... tons.

Value I
$

Shipped J ..... tons.

Value L
$

Stocks M ..... tons.

Balance to sell N ..... tons.

Product O ..... tons.

Lbs. Ore P

Product R

Coke S

Product T

Stone U

Yield V

% off Iron W

Accidents X

Injured total Y

Injured 2 Z

Injured 1 AA

Minor accidents BB

Fig. 1—Croxton Efficiency System. Blank Used by Individual Furnace Company. Right-hand portion detached for use at meeting

These blanks are furnished to each representative at the meeting by the secretary of the association, and the column headed 'Last Month' is already filled on the blanks as furnished from the secretary's records. Each representative fills in the rest of the blank as the announcements are made by the adding machine operator.

"This work can easily be done in an hour at a meeting, and it gives an opportunity for all present to thoroughly digest all the facts and figures relating to the industry; thus some very effective and illuminating discussion has been brought out at almost every meeting.

"At the right of the recapitulation blank above the middle will be noticed 'Profit or Loss on Shipments Month of ————.' This is the theoretical cost deducted from the shipment price. The difference will show profit or loss on the tons shipped during the month, which multiplied out shows the gross profit or loss.

"The next item shows the 'Profit or Loss on Sales for the Month,' and is only interesting in that it shows what the industry is doing in the way of making sales above or below its own theoretical cost, and thereby contractual profits or losses.

"The item below, which is the 'Profit or Loss on Unfilled Orders on the Books' shows the aggregate contractual profit or loss as based on the last month's figures of cost shown by this statement.

ADDITIONS TO COST CHARGES

"The district cost, as will be noted by referring to the 'Confidential Figures' blank (Fig. 1), is made up without any charge for selling cost, depreciation, interest or discount, bond interest or retirement or capital interest. To this district cost, in order to find the theoretical district cost, has been added an arbitrary selling cost, which has been agreed upon by each district and an arbitrary depreciation and arbitrary

The Croxton Efficiency System

RECAPITULATION OF CONDITIONS.....District.

For month..... .....

For private use of members only

Date.....

Commercial Efficiency

	DATE	TONS	LAST MONTH	INCREASE	DECREASE	My % Last Month	My % Now
Stocks on hand							
Made during							
Shipments during							
Sales during							
Unfilled orders							
Iron to sell.....to							

No. stacks operating..... No. stacks reporting.....

Capacity of District against which sales are made.....

No. Companies reporting.....

Sold make to..... Value.....

% sold up.....

Monthly District Capacity.....

% of total Reporting.....

COSTS AND PRICES	DATE	My Figures	District Figures	LAST MONTH	MY FIGURES ARE LOWER	MY FIGURES ARE HIGHER
District average comparative cost for		$	$		$	$
District average price shipments		$	$		$	$
District average selling price		$	$		$	$
District average price unfilled orders		$	$		$	$

Profits and losses on shipments month of .....

Shipment Price

Theoretical cost _____

..... on ..... tons = $.....

Last month ..... on ..... tons = $.....

THEORETICAL DISTRICT COST	DATE		MY COST	
District average comparative cost		$	*As reported*	$
Add selling cost or commission		$	*Selling Cost or Com'n*	$
Depreciation		$	*Depreciation*	$
Interest or Discount		$	*Interest and Discount*	$
Fixed Capital Interest @ 6%		$	*Fixed Capital Interest @ 6%*	$
Working Capital Interest @ 6%		$	*Working Capital Interest @ 6%*	$
Theoretical Cost,		*Total $*		*Total $*

Profit and loss on sales for month of .....

Sales

Theoretical cost _____

..... on ..... tons = $.....

Last month ..... tons = $.....

Profit or loss on unfilled orders on books

Price of orders .....

Theoretical cost _____

..... on ..... tons = $.....

Last month ..... tons = $.....

Operating Efficiency

		LAST MONTH	MY FIGURES	MEMORANDA
Average Daily Production per Stack	tons	tons		
Average No. lbs. Ore per ton Iron	lbs.	lbs.	lbs.	
Average No. lbs. Coke per ton Iron	lbs.	lbs.	lbs.	
Average No. lbs. Stone per ton Iron	lbs.	lbs.	lbs.	
Average % yield	%	%	%	
% Iron made above, .05 Sul.			%	

Safety Efficiency

Total No. Accidents reported				
No. Deaths or Permanent Disability				
No. injured losing 2 eyes, legs or arms				
No. injured losing 1 eye, leg or arm				
No. minor accidents				

Fig. 2—**Croxton Efficiency System. Blank to Which Totals of Individual Company Returns Are Transferred at District Meetings**

interest and discount.

"But for the best operation of the system which it is hoped will be developed in this form, a correct charge should be made for interest on working capital, which should be simply the interest on the value of the inventories of both raw and finished materials, and on accounts receivable. There should also be capital interest on the amount of money actually involved in the construction of the plants. Depreciation should be agreed upon, after discussion, as a per ton item, and selling cost and commissions also should be worked out on an average basis, which would give a correct representation of the industry.

"The whole thought in connection with this work comes down to this—that no industry can be expected to run and develop without having a return on the capital invested, comparing favorable with the usual return on capital. The idea is that a complete study of this kind will develop among those interested a clearer understanding of all of the facts about the industry, and that such an understanding will naturally tend to bring about a fairer result for all concerned. An intimate study of costs of operation should lead to lower costs for companies whose figures are high, and to a general betterment of the industry. The whole study is of operations which are past; it is only by actual experience that we can learn wisdom for the future.

"It may be interesting to know that the pig iron industry is now applying this system to the charcoal furnaces of Michigan, and to the coke furnaces of Chicago, Cleveland, Central Western, Buffalo, Philadelphia and Virginia districts, these representing about 95 per cent. of all the iron made in this territory."

Seventy-five Years of Anthracite Pig Iron

Catasauqua, Pa., is celebrating this week the seventy-fifth anniversary of the building of the first blast furnace to use anthracite for smelting iron ore. This furnace was the first of the Crane group at Catasauqua, now operated by the Empire Steel & Iron Company. It was built in 1839 by David Thomas, who later became the head of the Thomas Iron Company. The first iron was made July 4, 1840. A feature of this week's celebration was a public meeting at which Leonard Peckitt, president of the Empire Steel & Iron Company, as president of the Old Home Week Association of Catasauqua, welcomed those who had returned to their old home for the week to take part in its celebration. In paying tribute to David Thomas, Mr. Peckitt read the memorial to him adopted by the American Institute of Mining Engineers, August 21, 1882. Mr. Thomas's death, at the age of 87, occurred shortly before that time.

A conference is to be held in Chicago on Wednesday, July 8, between the wage committee of the Amalgamated Association and the Western Bar Iron Association in an effort to arrange the puddling and bar-iron scales for the year beginning July 1. Several puddling plants in the Pittsburgh district, including the Lockhart Iron & Steel Company, are practically idle pending settlement of the puddling scale and also to make repairs.

The Marting Iron & Steel Company's offices at Ironton, Ohio, were destroyed by fire June 27, but all important records were saved.

The report that the Republic Iron & Steel Company, Youngstown, Ohio, has placed orders for 85 more by-product coke ovens is officially denied.

Directors of the La Belle Iron Works, Steubenville, Ohio, met June 30 and passed the dividend on the common stock.

Chairman Gary on Business Conditions

Judge Elbert H. Gary, chairman of the United States Steel Corporation, sailed on the Aquitania July 1 for his annual vacation in Europe. As representing his views on the business situation a copy was given out of his address to the presidents of the Steel Corporation subsidiary companies in New York June 25. Among other things he said:

"I believe that in the early autumn we shall see an improvement in our business conditions. We are already witnessing an increase in tonnage, and it will be further increased, I trust. * * * It seems to me it would be foolish to claim that business conditions generally in this country at the present time are satisfactory. I think you agree with me that in our lines, taken as a whole, business conditions during the last few months have been worse than they have been before at any time during the last decade. * * *

"In this country the depression has been worse than in many other countries. The tariff law lately passed has adversely affected the business conditions of this country, in my judgment. While the imports of iron and steel to this country may not be large as compared with the total of our production yet if they are not large it will be because the prices are so low that the foreign manufacturers cannot afford even to dump their surplus into this country. And that brings the people of this country, including not only those who furnish capital for doing business but also the working men of the country, into active competition with labor of foreign countries, paid very meagerly as compared with the wages paid in this country.

"You have in your minds at the present time, no doubt, because of your environments and a prevailing sentiment, the question of wages of your employees. You know that some are making reductions. Others in large numbers are contemplating general reductions. * * * I have this to say: When we feel we are required to take any action we dislike, whether it is in competition with other manufacturers or whether it is in reducing the wages of our men, then it is soon enough for us to dispose of these questions. When we feel we are forced to do a thing in self-defense then we have no right to shut our eyes to the facts. But until we believe it is imperative to reduce the wages of our men I hope we will not do it.

"But whether you are compelled to reduce your wages or not I trust you will give due credit to the claims and to the merits of your men in connection with the possibility of your resources before you conclude to make reductions."

British Steel Production in 1913

Our London correspondent cables under date of June 30 that the production of steel in Great Britain in 1913 was as follows:

	Gross tons
Acid open-hearth	3,811,000
Basic open-hearth	2,252,000
Acid Bessemer	1,049,000
Basic Bessemer	552,000
Total	7,664,000

The production of puddled bars in 1913 was 1,207,000 gross tons; finished iron bars, 1,121,000 tons; mild steel bars, 967,000 tons.

The total production of open-hearth and Bessemer steel in Great Britain in 1912 was 6,796,000 gross tons.

The Bacher Iron & Steel Company, recently organized, has established a plant at 134 East Miller avenue, Akron, Ohio, and will manufacture, by a special process, steel castings, aluminum steel castings and aluminum bronze and brass castings. A specialty will be made of castings of a composition of aluminum and steel. This composition makes a light and strong metal, well adapted for various purposes.

The Heald Machine Company, Worcester, Mass., maker of grinding machines, has opened a branch office in Cleveland, Ohio, in charge of James G. Wonn. The office is located at 1030 Engineers Building.

Book Reviews

Cambria Steel. Handbook of Information Concerning Structural Steel. Prepared and compiled by George E. Thackray, C. E. Pages, 513; 4¼ x 6⅝ in.; generously illustrated. Published by the Cambria Steel Company, Johnstown, Pa. Price, $1.25.

In this, the eleventh, edition of Cambria's handbook of information relating to structural steel, most of the matter of the preceding edition is retained, although it has, however, been revised and considerable new matter added. The lists of angles have been rearranged and a few odd thicknesses have been omitted, as well as the publication of bulb beams. New sections of structural steel have been added, together with a new series of bulb angles and additional weights of ship channels, and the tables of weights, dimensions, properties, safe loads, etc., have been amplified by the addition of data relating to these new sections. Other changes include additions to the table of the properties of standard rails, so that it includes the various sections of recent standard rails and the tables of dimensions and safe loads for plate girders, 50 additional girders being included. The table of weights for flat rolled steel bars has been extended to include a greater number of sizes than formerly, the table including thicknesses from 1/16 to 2 in., with steps of 1/16 in. and widths of from 1 to 12¾ in., advancing by ¼-in. steps. Data from the building laws of 31 American cities are given. New tables, giving both the dimensions and properties of standard pipe, have been substituted for the previous one giving the dimensions only and the specifications for structural and boiler steel have also been revised. The usual tables of areas and circumference of circles, trigonometric functions and square and cube roots are included.

McAndrew's Floating School. By Capt. C. A. McAllister. Pages, 250, 6 x 8½ in.; illustrations, 37. Published by the Aldrich Publishing Company, 17 Battery place, New York City. Price, $2.

In the form of a story this book tells what is required by a candidate for an engineer's license under either the British Board of Trade or the United States steam vessel inspection service. It deals with four ambitious young men who decide to work their way up from positions as oilers, coal passers, water tenders and firemen to licensed engineers, and brings in points on marine engineering. The instruction is given in the form of lectures, which cover a wide variety of subjects, beginning with explanations of force, work and power, heat, combustion and generation of steam. The various materials used in marine engineering are taken up, so that their limitations and usefulness can be fully comprehended. A large number of questions and answers is contained in the final chapter of the book, which is written so that the reader unconsciously absorbs a vast amount of practical and necessary information without realizing that he is studying.

The Job, The Man, The Boss.—By Katherine M. H. Blackford, M. D., and Arthur Newcomb. Pages, xvii + 266; 5¼ x 8 in.; illustrated from photographs. Published by Doubleday, Page & Co., Garden City, N. Y. Price, $1.50.

A timely book is this volume of the Newcombs. It has been waited for by students of management, who have recognized the need of all possible help in placing the right man in the right job. To most of such the book may be what was expected, but to the less well informed, who may have noted with mixed conclusions the previously published papers of Dr. Blackford on this general subject, it is likely to be a disappointment. Even these will admit that the effort is an excellent one, as it is so rich in suggestion that mere reading, let alone study of the book, is highly profitable and not without its conviction that the authors have more than an academic knowledge of the selection and placing of men in work and that gradually we shall perhaps be evolving a science in analyzing human capabilities so far as anything exact is possible in this realm.

Much of the book is general in its nature, and is decidedly entertaining, to say the least, regarding the reliability which may be placed on an analysis such as the authors outline. The nearest approach to a practical application is in the publication of types of blanks which may be used in an employment department, these with the authors' discussion thereon affording considerable by way of suggestion to the one who desires seriously to apply what the book aims to develop. With the claim that it is desirable to place the man in the work for which he shows the best aptitude, and that commonly men may be transferred to different occupations or under different conditions in the same institution and prosper, the average reader will have no quarrel, and he may be led into a desirable introspection of himself in reading such chapters as those covering the boss and the art of handling men. Incidentally the authors hold that scientific employment supervision opens up a new field for women. Their observation is that women are especially well fitted for such work, to which one would be inclined to agree on reading the chapter covering the requirements.

The present review partakes of random references to the book, rather than a formal enumeration of its divisions, but the idea behind the book is that for each job in an organization there is one man by natural aptitude, training and experience best fitted to fill the requirements of that job and that the plan may be developed to locate that individual without adopting the usual hire-and-fire plan. There is a good deal of wholesome truism pervading the book and some remarkable instances of the application of the observational method of character analysis, although it is refreshing to read that the authors say "So far our studies and experiences do not lead us to expect that it ever can become absolute and exact."

Much of the analysis of human character lies around nine physical variables ranked as fundamentals, these including the color of the individual, that is to say whether or not he is a blond or brunette; general points as to form, size; texture, so called; consistency; proportions; expression, etc. It is about these divisions of analysis that one finds some doubt, but not lack of interest, as stated.

Finally, in discussing the importance of the correct placing of the individual into his vocation and indicating the value of vocational guidance in our schools, the authors state that the records of a thousand persons, taken from their files, show that 763 or 76.3 per cent. felt that they were in the wrong vocation. Of these 414 were 35 years old or older. Most of these claimed that they had entered upon the occupation because they had drifted along the lines of the least resistance or had been badly advised. Quotation is also made of the statement of a prominent physician that of 48 graduated from school with him, only 3, he felt, were safe to consult with on medical subjects.

The Proceedings of the Association of Iron and Steel Electrical Engineers for 1913 is an impressive volume of 393 pages, taken up almost wholly with the printing of papers and the discussions following their presentation. These include such subjects as lifting magnets, switching devices for power circuits, kinds of lamps used in steel mills, the motor drive for steel mills, and the electric furnace. Some of these have, of course, been noted at greater or less length in these columns. The book contains a portrait of the president for 1913, C. W. Parkhurst, electrical engineer, Cambria Steel Company, Johnstown, Pa. Particulars concerning the volume may undoubtedly be had by writing to the secretary of the Association, W. T. Snyder, electrical superintendent of the National Tube Company, McKeesport, Pa. The president this year is E. Friedlaender, superintendent of the electrical department, Edgar Thomson Works, Carnegie Steel Company, Braddock, Pa.

French iron-ore production in 1913, according to official figures, amounted to 21,714,000 metric tons, as against 19,160,000 tons in 1912, an increase of 2,554,000 tons. The home consumption in 1913 was 13,385,000 tons, and in 1912 was 12,296,000 tons.

TESTING MATERIALS MEETING

First Day of the Annual Gathering of the American Society at Atlantic City

ATLANTIC CITY, N. J., June 30, 1914.—At this writing it is too early to gauge the influence of the annual meeting of the American Society for Testing Materials which began this morning at the Hotel Traymore. It seems clear, however, that the clashes over specification details, staged formerly in open meeting, have passed and instead the differences are ironed out in committee before reports are transmitted to the society as a whole. It has been noted of late that final committee reports have been substantially unanimous and the favorable vote on these reports in the meeting and in the subsequent mail ballot has been merely a matter of form.

LETTER BALLOT MEANS LITTLE

Recognizing the status of the mail ballot, represented for example by a total vote of only 95 from a membership of 1620, when a vote was submitted a year ago on 32 proposed standards, Prof. Edgar Marburg, in a paper scheduled for this evening's session, put a large interrogation before the society. An experience of 14 years convinces him that the letter ballot is almost meaningless. In all these years, he points out, every proposed standard that survived the cross-fire at annual meetings has been approved by letter ballot, though this represented only a small fractional part of the membership. The procedure of committees, as prescribed now by the general regulations, works to safeguard the results of their deliberations, and Professor Marburg emphasizes the fact that it has come to be recognized that every provision in a proposed standard must receive practically the unanimous endorsement of the committee. He suggests the futility of the mail ballot in the light of the large size of the committees, the relation in proportionality of producer and non-producer on committees and the numerous and well attended committee meetings.

NEW STEEL SPECIFICATIONS

An imposing number of new specifications will be presented, mostly at the Wednesday morning session. They include specifications for structural steel for cars; carbon steel bars for springs; methods of chemical analysis for plain carbon steel; recommended practice for annealing carbon-steel castings; recommended practice for the heat treatment of case-hardened carbon-steel objects; Bessemer automatic screw stock of cold drawn steel, and standard methods for Brinell hardness tests of metals. A large number of revisions to existing specifications has been proposed, including carbon-steel rails, splice bars, structural steel, billets for reinforcing bars, steel forgings, axles, staybolt iron, and spelter and manganese bronze ingots.

The annual report of the executive committee showed a net increase of 113 members, against an average annual increase of 100 for the six years preceding the last. The total membership is now 1687. Three new committees were created in the year: Refractory materials, Edward Orton, Jr., Ohio State University, temporary chairman; standard tests of concrete and concrete aggregates; standard tests and specifications for shipping containers, Lieut.-Col. B. W. Dunn, U. S. A., chairman. It is intended to publish an alphabetical glossary of terms and definitions in the Year Book as soon as the number of standard definitions warrants.

NEW OFFICERS

The officers for next year, nominated by the nominating committee earlier in the year, are as follows:

President, A. W. Gibbs, chief mechanical engineer, Pennsylvania Railroad, Philadelphia.

Vice-president, A. A. Stevenson, vice-president Standard Steel Works Company, Philadelphia.

Secretary-Treasurer, Prof. Edgar Marburg, University of Pennsylvania.

Members of executive committee: Robert Job, Milton Hersey Company, Montreal, Que.; F. W. Kelley, Helderberg Cement Company, Albany, N. Y.; Prof. Anson Marston, Iowa State College, Ames, Iowa; S. S. Voorhees, engineer-chemist, Bureau of Standards, Washington, D. C.

NEW TEST FOR METALLIC PROTECTIVE COATINGS

In the afternoon session to-day a paper was presented by J. A. Capp, General Electric Company, covering a method of testing galvanizing, sherardizing, lohmanizing and other processes of coating iron and steel. The test consists in exposing the articles in any convenient chamber into which there is projected an atomized spray of water saturated with common salt in solution, care being taken to avoid placing the test specimens directly in the path of the jet. To insure constant saturation, an excess of salt is kept in the water at the bottom of the chamber. The spray is produced by a jet of compressed air lifting the water to the nozzle, whence it is projected as a cloud. This apparatus is the common atomizer, so-called, used in the household. The chamber is necessarily not tightly sealed, but is open sufficiently to permit "breathing"; when used with an air jet, there is a slight pressure which is relieved through the breathing openings. If desired, the test may be modified by the use of a fine steam jet to raise the temperature of the atmosphere in the chamber. There is also the possibility of rendering the test atmosphere slightly acid or alkaline by suitable additions to the water in substitution for the salt.

When exposed as described, articles have a very thin film of moisture over their surface, but there should be very few, if any, drops of sensible size on the objects. The test has been used five or six years as a check on the process of sherardizing. When the coating is relatively thin and poor, rust may develop in from 2 or 3 hr. to 24 hr., or longer. A better coat will last two or three days, but a well-applied coat of requisite thickness will last at least a week. If no rusting is developed in two weeks' time, it may safely be assumed that the life of the coating will be practically indefinite. These figures are based on experience with both sherardized and galvanized types of coating. The salt-spray test is only an exaggeration of what may be expected at the seashore and differs only in degree, not in kind, from the normal conditions under which the article is intended to be used.

Among other important papers of the afternoon's session, which was given over to non-ferrous subjects, were: "Method of Sampling and Analysis of Tin, Terne and Lead-Coated Sheets," by J. A. Aupperle, American Rolling Mill Company, and "Study of the Strength of Non-ferrous Castings—Comparison of Different Test Specimens," by L. P. Webbert. It is planned to present the main points of these papers in a later issue.

In the evening session, opened with the formal address of Prof. A. N. Talbot, as retiring president, a report of the proceedings of the Turin meeting of the council of the International Association for Testing Materials was received from Dr. Henry M. Howe. The importance of that meeting in developing the change of attitude necessary to the consummation of international standards is indicated in the publication of the report elsewhere in this issue.

One other interesting contribution of the meeting was made by J. J. Thomas in a paper offering a factor to convert, if possible, the Brinell ball test hardness numbers to scleroscope readings. From the plotting of over 500 readings, he suggests a factor of 6.67 for steels; that is, the scleroscope reading multiplied by 6.67 gives the Brinell ball hardness number. For cast iron and bronzes he gives the factor 5.25. The factor for aluminum appears to be about 6 and for nickel steel about 7.7. The author admits considerable variation in the factor for the same metal, probably due to the fact that the scleroscope measures hardness of very small areas and these areas vary in hardness even in the same metal.

The Ansonia Mfg. Company, Ansonia, Conn., has purchased the Hampden Machine Screw Company, Springfield, Mass., and will remove the business and equipment to Ansonia at once. Archibald R. Lemieux, formerly secretary and manager of the Hampden Machine Screw Company, becomes general manager of the Ansonia Mfg. Company.

Progress Toward International Specifications

Some American Proposals on Cast Iron Accepted—Action at Turin in Favor of Export Specifications

The American members of the International Committee on Standard Specifications for Cast Iron, Walter Wood and Dr. Richard Moldenke, reported to the American Society for Testing Materials at Atlantic City this week that the first definite steps have been taken along this line, and that there have been presented to the Council of the International Association for Testing Materials proposals for standard specifications for pig iron, for cast-iron pipe, and for an international test bar for judging the quality of the metal entering into iron castings. These proposals are intended for the export trade of the world only.

The idea of enlarging the scope of the International Association to include standard specifications for materials of construction was first brought before that society at the Buda Pesth Congress of 1901. Prof. H. M. Howe presented the matter at the time as the wish of the American membership, and aided by the two gentlemen above named, succeeded in arousing sufficient interest to have the necessary committees appointed. The government control existing in most of the countries interested, the extreme care shown to guard home interests when going after export trade, the manner of converting raw materials into finished products—all these things militated against a speedy consummation of this work, and hence standard international specifications seemed like a desirable but visionary undertaking.

It was no wonder, therefore, that attempts to unify the several specifications for steel and cast iron, to serve international purposes, failed to arouse sufficient response to make them worth continuing. When, however, the idea was advanced by the American members of the committee reporting on the subject, that the standard specifications of the several countries interested should not be touched, but that based upon these a set of specifications should be drawn up to serve as international ones for export trade only, immediate interest was manifested and tangible results seemed likely.

PROGRESS BY THE CAST IRON COMMITTEE

During last summer preparations were made by the American members of the Committee on Cast Iron to visit Europe and to push the matter as energetically as possible. As there was some difficulty in getting together the International Committee (consisting of the English, German and American members) every individual member was visited and urged to get busy. Moreover, the most prominent men of the producing and consuming elements of a number of countries were interviewed and their advice and co-operation obtained. In this way a committee meeting in Brussels, December 5, 1913, brought about definite proposals for pig iron, pipe, and the International Test Bar. The proposals were originally drawn up on American lines, modified by the German members to suit the Continent, with co-operation from Belgium and France, and there was aid from some British producers. With the exception of the test bar, however, the English members would not adopt the work thus prepared, but submitted a minority report to the Council of the International Association. This is on pig iron, and conforms to English blast furnace practice in having but few grades with rather wide variations and would be considered by American consumers as far behind the state of the art.

In order that the underlying idea of the Americans might be well understood by the individual members of the International Council, and to aid Professor Howe, the American representative on the Council, with necessary details for the presentation of the matter at the Turin Council meeting April 4, 1914, a second European trip was undertaken by the American members of the Cast Iron Committee and thus the interest of other countries enlisted.

The discussion of this question was probably the most important matter coming before the Council at Turin in April, and in line with the resolutions of the New York Congress of September, 1912. A sub-committee on the preparation of standard methods of sampling and analysis for cast iron was authorized, and has since been designated. The members for England are J. E. Stead and F. W. Harbord; for Germany, the Krupp Laboratories, and for the United States, Dr. Hillebrand of the U. S. Bureau of Standards.

The action of the Council at Turin on the proposals of the Cast Iron Committee presented to it is as follows: "That the work of committee 1 (b) be continued, and the results so far attained be immediately issued in the Transactions of the Association, to render exchange of opinion possible before the St. Petersburg Congress." This Congress convenes in August, 1915, and it is hoped will take definite action on the standard specifications for export presented.

TURIN MEETING FAVORS EXPORT SPECIFICATIONS

The most important resolution adopted at the Turin meeting of the International Council in April was one definitely committing the International Association to the work of producing international specifications for export trade. This action is particularly significant in view of the resolution on this subject passed at the 1912 Congress in New York which seemed to relegate any effort toward international specifications to the indefinite future. The resolution as given by Professor Howe in a report on the Turin meeting presented at Atlantic City this week is as follows:

"That the Council of the International Association for Testing Materials welcomes the preparation of standard specifications for the delivery of materials of construction intended for export in international trading.

"The Council fully realizes the difficulties attending any attempt to unify existing specifications of the countries adhering to the association, but sees in the agreement upon standard specifications for export purposes a distinct advance in international efficiency and comity.

"The Council asks a full discussion and trial of the standard specifications so far presented, so that, if possible, final action may be taken at the St. Petersburg Congress. The Council also hopes to secure further proposals, and requests that each country may stimulate its industries toward early action along standard specifications for international trading purposes, in conjunction with the other producing countries."

PROPOSAL FOR INTERNATIONAL TEST BAR

Below is the resolution on the subject of an international standard cast-iron test bar adopted at the meeting of Committee 1(b) at Brussels, December 5, 1913:

1. In order to obtain a reasonable uniform test bar (arbitration bar) for judging the qualities of iron poured into castings, with reference to existing systems of measurement, a bar shall be selected for testing transversely on supports 18 in. apart (45 cm.) and that the diameter of this round bar shall be 1.2 in. (30 mm.), the relation of length to diameter being 15 to 1 as nearly as may be.

2. The bars shall be cast in dry sand molds, vertically and with top pour. They shall be cast 20 in. (50 cm.) long, and be rounded at the bottom. The

load in testing shall not be applied faster than 3 seconds for every hundredth part of the diameter. For every specification mixture two molds with three test bars each shall be cast, the bars to be cold before removal from the molds which should have attained the shop temperature before pouring. The bars shall be brushed clean and not rumbled.

PROPOSAL FOR INTERNATIONAL EXPORT SPECIFICATIONS FOR PIG IRON

At the meeting of Committee 1(b) at Brussels, as referred to above, the following was adopted for recommendation to the Council of the International Association:

(1) It is proposed that for international trading purposes in pig iron, the analysis be taken as the basis, inasmuch as the value depends upon its content.

(2) The following specifications for pig iron are recommended where the customary trade designations are insufficient (see tables below). For silicon a variation of 0.25 per cent. from analysis asked for, either way, shall be allowable. For sulphur and phosphorus the maxima given shall govern. For manganese a variation of 0.20 per cent. either way shall be allowable.

Silicon

Per cent.	Code
0.50	La
0.75	LaX
1.00	Le
1.25	LeX
1.50	Li
1.75	LiX
2.00	Lo
2.25	LoX
2.50	Lu
2.75	LuX
3.00	Ly
3.25	LyX
3.50	Lh
3.75	LhX

Variation 0.25 either way allowable.

Sulphur

Per cent.	Code
0.02	Sa
0.03	Se
0.04	Si
0.05	So
0.06	Su
0.07	Sy
0.08	Sh

(Maximum)

Phosphorus

Per cent.	Code
0.050	P
0.100	Pa
0.250	Pe
0.500	Pi
0.750	Po
1.000	Pu
1.500	Py
2.000	Ph

(Maximum)

Manganese

Per cent.	Code
0.20	Ma
0.40	Me
0.60	Mi
0.80	Mo
1.00	Mu
1.25	My
1.50	Mh

Variation 0.20 either way allowable.

It was resolved that the code words above given are to be specially recommended as most useful for international commerce in pig iron.

The English members of Committee 1(b), while concurring in the specifications for cast-iron test bars, did not accept the above pig-iron specifications, but instead suggested the following:

Grade	Silicon, per cent.	Sulphur, Max. per cent.	Phosphorus, Max. per cent.	Manganese, per cent.
1	2.5 to 3.5	0.05	1.750	0.40 to 1.00
2	2.0 to 3.0	0.08	1.750	0.40 to 1.00
3	1.5 to 2.5	0.12	1.750	0.40 to 1.00

Committee 1(b) also recommended international specifications for cast-iron pipe and fittings. From this the English members also dissented.

Pittsburgh and Nearby Districts

The directors of the Youngstown Iron & Steel Company, Youngstown, Ohio, have selected Julian Kennedy, Pittsburgh, as consulting engineer for the new open-hearth plant to be built by the company in East Youngstown. The plant will cost about $1,000,000 and will consist of three 75-ton open-hearth furnaces, a sheet-bar mill, a slab mill and a universal plate mill. Ground will be set aside for five more furnaces, which the company expects to build when the demand justifies. The location is near the Mary blast furnace of the Ohio Iron & Steel Company, and it is the intention to use direct metal from that stack. The plant is expected to be completed about April 1, 1915, and will have an annual capacity of 120,000 tons of steel, practically all of which will be used in the company's own sheet mills. It is the intention to make the plant strictly modern. Electricity will largely be used for power.

The Meehan Boiler & Construction Company, Lowellville, Ohio, is building a battery of 700-hp. boilers for the Kelly Nail & Iron Company, Ironton, Ohio.

The Crichton Enamel Company, Ellwood City, Pa., manufacturer of iron signs, etc., has been reorganized with a capital stock of $25,000. Some additions will be made to the equipment, including machinery and furnaces. Alfred Wycherley is general superintendent.

The Marshall Foundry Company, Pittsburgh, has received an order for castings to cost $65,000 for the open-hearth furnaces and soaking pits of the new steel works now being built by Corrigan, McKinney & Co., Cleveland, Ohio.

The Deidrick Glass Company, Monaca, Pa., has been incorporated with a capital stock of $30,000 by H. W. Deidrick, Beaver, Pa., and others. It will build a factory for the manufacture of glass signs, etc.

The smelter of the Mineral Point Zinc Company at Tiltonville, Ohio, across the river from Wheeling, W. Va., built at a cost of $500,000, has been completed. The product will be sulphuric acid varying in strength from 60 to 98 per cent., which will be used in the manufacturing plants of the Wheeling district. The plant when operating in full will produce 10,000 gal. of acid daily.

The Wheeling Mold & Foundry Company, Wheeling, W. Va., has received the contract for equipping the new steel mill for the St. Louis Screw Company at St. Louis, Mo. The principal items consist of 18-in. and 9-in. bar mills and a heavy lever shear.

The Riter-Conley Mfg. Company, Pittsburgh, has taken a contract for two steel buildings for the Western Reserve Steel Company, Warren, Ohio, one to be 80 x 264 ft. and one 175 x 624 ft., which will require about 750 tons of structural steel; also, 20 55,000 bbl. oil tanks to be erected in the Cushing oil fields, each weighing about 150 tons; also a contract for the International Smelting & Refining Company, Miami, Ariz., for oil tanks, etc., taking about 400 tons of plates; also, a contract from the Great Falls Power Company, Volta, Mont., for penstocks, etc., taking about 1500 tons of plates; also a contract for furnishing the Cuthbert Brothers Company structural steel for a seven-story building to be erected for the Fidelity Title & Trust Company.

Stockholders of the Westinghouse Machine Company held their annual meeting last week and elected Henry Herman Westinghouse president, to succeed his brother, the late George Westinghouse. Charles A. Terry was elected a director in place of George Westinghouse. H. T. Herr was re-elected vice-president and general manager. Formerly H. H. Westinghouse was the only other vice-president, but the number of vice-presidents was increased to four, and the following elected in addition to Mr. Herr: W. D. Uptegraff, in charge of finance; W. A. Bole, in charge of production; E. H. Sniffein, in charge of sales. J. D. Callery was elected chairman of the executive committee, which, in addition to Mr. Callery, consists of H. M. Brackenridge, John F. Miller, J. R. McCune and W. D. Uptegraff.

The Pittsburgh Plate Glass Company, Pittsburgh, has placed an order with the Chapman Engineering Company, Mt. Vernon, Ohio, for five 10-ft. rotary gas producers, this being the second installation of Chapman producers for the Plate Glass Company. Orders for Chapman producers have also been received from the American Clay Company, Terre Haute, Ind., and the American Bolt Company, Newark, Ohio.

Officers and members of the executive programme and membership committees of the Pittsburgh Foundrymen's Association held a meeting in the Fort Pitt Hotel, Pittsburgh, June 26, to arrange plans for 1914-15. H. J. Koch, Fort Pitt Steel Casting Company, McKeesport, Pa., president of the association, has arranged the programme committee for the coming year as follows: W. R. McCord, chairman; W. B. Robinson, C. H. Gale, Henry Spilker and C. F. Williams.

The Machinery Markets

In none of the machinery manufacturing districts is there evidence of an immediate revival of demand for machine tools and general machinery, and the reports from the cities where most of the sales are made are no more cheerful. Locally, New York is quiet, though a few fair sales have been made and reports are heard as to encouraging export business. New England, also, has felt a betterment in the foreign demand, though the level of the last few weeks is unchanged. Chicago has had some increase in inquiries, but otherwise the market is colorless. The Milwaukee trade has found business dull. In Detroit business in June was spotty and at times fair, with the last week unsatisfactory, though furniture makers closed for special equipment. Cleveland makers of automobile products promise to do some good buying, but business at present is dull. Inactivity in Cincinnati, both in export and domestic business, probably will cause some extra long shop shutdowns, following July 4. In the Central South there has been a better demand for various kinds of equipment and sales have been made, but at the expense of prices. In St. Louis there are indications of many new manufacturing enterprises and trade is improving slowly. Birmingham reports that business is light. Cotton gins and compresses are in good demand in Texas. In the Pacific Northwest the orders for machine tools are small, but slightly more numerous, and there is a fair movement in milling and mining equipment and power units for irrigating.

New York

NEW YORK, July 1, 1914.

Business continues extremely quiet with the majority of machinery houses so far as buying in this immediate territory is concerned, though a few sales which are considered good in view of existing conditions have come to light. These transactions have been confined to a few sellers, but have given encouragement to others. A manufacturer of automobile parts in this city placed an order for $10,000 worth of machine tools and a maker of paper bags placed an order for repair equipment valued at $6000. Transactions outside of this city include the opening of bids June 29 for ten turret lathes, ranging from ⅜-in. to 2-in. spindle capacity for the Frankford Arsenal and the purchase of punches and shears valued at $2000 for the Charlestown Navy Yard. It is reported that an automobile manufacturer in the northern part of the State will be in the market before long for a good list of machine tools required for an extension to the plant. The trade is hearing with satisfaction of a number of good export orders which have been booked of late. While these do not help to swell the volume of orders at New York, they are a source of satisfaction. Forging machines, turret lathes and automatic screw machines are specified in the orders received. These orders have been sufficient to cause one New England maker of automatics to go on full time again. The Russian government has been a good buyer for its ordnance shops and navy yards and there has been some private buying as well. In the last week, confirmation was received of the sale of a heavy machine tool to go to South America. While these facts look good to the trade the fact remains that the bulk of local buying consists of small orders for replacements and repairs.

The Public Service Electric Company, 755 Broad street, Newark, N. J., is having plans prepared for a large power house at Point-no-Point on the Passaic River, to develop approximately 200,000 hp. When finished the plant will be 285 x 366 ft., the largest of its kind in New Jersey. At present it is the intention of the company to erect a building 154 x 366 ft., making additions when necessary. There will be a turbine room containing two turbines of 25,000-kw. capacity each, with room for a third; a boiler house providing space for eight boilers, although only four will be set up, and a switch house. The plant will cost about $2,000,000 and is expected to be in operation in the late summer or fall of 1915.

The plant of the Richardson & Boynton Company, Dover, N. J., with the exception of the shipping department building, was destroyed by fire June 28, at an estimated loss of $500,000. The company manufactures stoves and ranges, and its works covered 30 acres of ground, employing 1100 men. The plant was shut down three weeks ago for repairs.

The Acme Worsted Mills, Jamestown, N. Y., of which L. M. Butman is general manager, has let contract for additions, 42 x 120 ft., two stories, and 42 x 120 ft., one story, to be made to the company's mills.

The New Process Gear Corporation, Syracuse, N. Y., has plans in preparation for a three-story addition, 72 x 95 ft., to be made to its plant on Plum street, to cost about $40,000.

The Arnot Ogden Hospital, Elmira, N. Y., of which E. E. Buchanan is superintendent, will erect and equip a laundry building, 40 x 60 ft. Bids are being taken.

The U. S. Smoke Eliminator Company, 710 Iroquois Building, Buffalo, N. Y., manufacturer of smoke consumers, has been incorporated by C. H. Weiss, and others, and has acquired a factory at Rochester, N. Y., fully equipped.

Kampfe Brothers, 8-12 Reade street, New York City, manufacturers of safety razors, will soon start the construction of a factory, 100 x 115 ft., of fireproof construction, and will install the latest type of special machinery required for their purposes. S. S. Suger, 600 West 181st street, New York City, is the architect.

The Condensite Company of America, Glen Ridge, N. J., will build a factory consisting of five one-story brick buildings, at Grove street and the Erie Railroad, Bloomfield, N. J. The estimated cost is $50,000. Percy B. Taylor, Essex Building, Newark, N. J., is the consulting engineer.

William and Charles Bechtold, 872 North Seventh street, Philadelphia, will build a laundry and a one-story brick boiler house at an estimated cost of $15,000.

The Joseph M. Mason Machine Company, room 40, Drexel Building, Philadelphia, has been incorporated with a capital stock of $100,000 by Joseph M. Mason, and others. It will specialize in the building of machines for utilizing scrap plate and sheet metal in the manufacture of hardware specialties, and will also manufacture these specialties. It will establish a machine shop, and besides using its own machines will also install other machines to carry on a general machine business.

Plans have been completed for a one-story reinforced concrete hydroelectric plant, 40 x 80 ft., for the Tracy Development Company, of which E. G. Gould, Seneca Falls, N. Y., is president. The Central New York Gas & Electric Company, of which W. H. Palmer, Geneva, is president, is the lessee. The estimated cost is about $200,000.

A one-story brick power house will be erected at 4023-4027 Irving street, Philadelphia, by James G. Doak & Co., for the Thomas W. Evans Museum, at a cost of $65,000.

The Garland Mfg. Company, Des Plaines, N. Y., has been incorporated by H. S. Garland, L. Witthold and C. H. Roe, to manufacture metal goods. The capital stock is $35,000.

Bids are being received until July 10 by Miss Mary Hinkley, president board of managers New York State Training School for Girls, Hudson, N. Y., for two horizontal tubular boilers and for heating, plumbing and electric work for the contagious hospital at that institution. Drawings and specifications are obtainable from Lewis F. Pilcher, State architect, Albany, N. Y.

The Columbian Rope Company, Auburn, N. Y., has completed plans for a one-story brick addition which it will make to its factory.

The George Traugott Mfg. Company, Rochester, N. Y., has filed incorporation papers with a capitalization of $50,000 and will equip a plant for the manufacture of concrete castings. George Traugott, J. C. Wagner and W. A. Sabin are the incorporators.

The R. H. Wool Company, Ithaca, N. Y., recently incorporated, will build and equip a bakery, confectionery and dairy plant. The capital stock is $50,000. R. H. and E. Wool, Ithaca, and E. C. Stewart, New York City, are the incorporators.

The Chalmers Knitting Company, Amsterdam, N. Y., has acquired property adjoining its present plant and will build an extension in the near future. Details of construction and equipment have not yet been decided upon.

The General Chemical Company, Buffalo, will add a pump and compressor building, of steel, to its plant.

New England

BOSTON, MASS., June 30, 1914.

The machinery trade continues along the level of the last few weeks. In spite of ultra-pessimistic reports, business is not so utterly bad. Foreign orders are being received in satisfactory volume. With some concerns they even exceed domestic orders. The great fire at Salem, Mass., caused a very serious loss to the industries of the city, the property of many of which was completely destroyed. Most of these houses are engaged in the shoe and leather business, but the largest of all is the Naumkeag Steam Cotton Company, employing some 3500 hands. Practically all of them will rebuild, including the Naumkeag Company, and the demand for miscellaneous machinery and mill supplies in general will reach large figures.

The machinery people are receiving a good many inquiries for equipment, but many of them are worded "How soon could you ship if business should revive," to quote the experience of one of the largest works in New England. It is perfectly apparent that a very great amount of machine-tool business is waiting only for some substantial indication of a revival of active demand before placing orders which should reach into large totals.

Prospective buyers should not lose sight of the fact that machine-tool stocks are not large, considering the fact that buying has not been really brisk for a long time. The men who are most intimately familiar with the situation are convinced that a sharp revival of trade, or even a gradual strengthening, will mean a depleted market and poor deliveries.

The Reed-Prentice Company, Worcester, Mass., has developed as a standard line the automatic lathe, a large order for which is in process of construction for the Ford Motor Company, Detroit, Mich. While designed primarily as a single purpose machine, the lathe lends itself to a wide variety of such work as is manufactured in large quantities.

The Reliance Metal Company, 1368 Washington street, Boston, has taken over a foundry at Norfolk Downs, Mass., and will manufacture brass, bronze, composition and aluminum castings. The premises will be refitted and manufacturing will begin at once.

Practically the entire 168,000 sq. ft. of floor space of the new Burgess-Lange industrial building, Worcester, Mass., has been leased for manufacturing, and already a second building of the same class is contemplated, the demand being considerably greater than the supply. The tenants will include the Lowell Wrench Company, branch factory of the Dennison Mfg. Company, South Framingham, Mass.; Boston Wrench Company, Boston; Massachusetts Machine Shops, Inc.; Thomas H. Boyle, machinist; Miller Wire Cloth Company, Hubbard Machine Company, Golbert Last Company, New Acme Plating Company, Majestic Mfg. Company, Walden Mfg. Company, wrenches; Standard Specialty Company, and J. E. Sheppard Company, machinist.

Chicago

CHICAGO, ILL., June 29, 1914.

Except for a slight increase in the number of inquiries, which, however, brought little improvement in the desirability of the business offered, the market maintains the colorless aspect which has distinguished it for several weeks. There is no railroad business of moment pending and industrial purchases or expansion of any kind appear to be equally at a standstill.

The Aladdin Electric Company, Chicago, has been organized with a capital stock of $10,000, to manufacture and deal in electrical and automobile merchandise, supplies, etc. Incorporators are Samuel P. Marmly, Jr., Norman C. Croshaw and Joseph Bonomo.

The Bigelow Company, Chicago, has been incorporated with a capital stock of $25,000 by C. E. Mudge, C. M. Bigelow and L. D. Bigelow, 833 Leclaire avenue, to manufacture implements and machinery.

The Western Lamp & Brass Company, 17 East Twenty-third street, Chicago, has increased its capital stock from $10,000 to $20,000.

The Trebla Engineering Company, Chicago, has been incorporated with a capital stock of $2500, to manufacture and deal in vapor and vacuum heating valves and specialties. Incorporators are Samuel A. Long, B. L. Willett and Frank P. McGinn, 29 South LaSalle street.

The Acme Electric Storage Battery Company, Chicago, has been organized with a capital stock of $14,000 by Roy Brundage MacDowell, Sidney J. Hall and A. C. Hunt.

Kusel & Harris, 30 North LaSalle street, Chicago, are erecting a public garage on Halsted street near Sheridan road, of brick and steel, 92 x 100 ft., to cost $20,000.

The W. M. Welch Mfg. Company, maker of school supplies, 1516 Orleans street, Chicago, is building an addition to its factory, 75 x 100 ft., to cost $10,000.

Fire in the plant of the Illinois Mfg. & Supply Company, Quincy, Ill., wrought damage to the extent of several thousand dollars, which is fully covered by insurance. Most of the stock was on the lower floor and was not damaged by fire but part of it was damaged by water.

The Safety Folding Ladder Company, Pekin, Ill., has been organized with a capital stock of $10,000, to manufacture and sell single extension and step ladders. Incorporators are William T. Pyle, Henry J. Schernber and M. D. Conaghan.

The Fitted Steel Sash Company, Champaign, Ill., has been incorporated with a capital stock of $45,000 by E. R. Kelso, Arthur Deeman and E. C. English.

The core room of the Quincy Foundry & Novelty Company, Quincy, Ill., was destroyed by fire. It is the expectation to restore the plant to operating conditions at once.

The Great Northern Equipment Company, Minneapolis, Minn., has been incorporated with a capital stock of $5,000,000, to manufacture railroad equipment. Incorporators are L. W. Hill, R. A. Jackson and L. E. Katzenbach, all Great Northern officials.

The Kewanee Water Supply Company, Kewanee, Ill., has increased its capital stock from $200,000 to $250,000 for the purpose of extending its equipment.

The Hillview Drainage District, Carrollton, Ill., F. A. Whiteside, attorney, will receive bids for equipment for a centrifugal pumping station including three electrically driven 30-in. pumps, with alternative bids on oil or steam power.

The Taylor Coal Company, Railway Exchange Building, St. Louis, has bought the Southern Illinois Coal & Coke Company's holdings in the Herrin district and will improve and increase the equipment.

The Citizens Pure Ice Company, Jacksonville, Ill., has been incorporated with a capital stock of $25,000 by W. J. Achelpohl, C. D. Johnson and E. W. Fowler and will engage in the manufacture of ice.

The Cedar Valley Power Company, of which H. H. Caughlan, Waterloo, Iowa, is president, will build a steam power and water plant at Charles City, Iowa, to be equipped with a steam turbine and modern electrical machinery. The headquarters of the company are at Charles City.

The Garland Mfg. Company, Des Plaines, Ill., has been organized with a capital stock of $35,000, to manufacture and deal in all kinds of metal goods. Louis Wittbold, Charles H. Roe and Harry S. Garland are the incorporators.

Milwaukee

MILWAUKEE, WIS., June 29, 1914.

The past week has been absolutely devoid of feature, and the improvement noted early in the month has not been accelerated. Here and there a fair booking causes hopes to rise, but on the whole business is dull, production is curtailed and payrolls remain stationary. Prospects for July are none too encouraging.

The Falk Company, Milwaukee, steel founder, machinist and manufacturer of railroad specialties, has disposed of its kerosene engine works, operated in connection with its general works, to the M. Rumely Company, LaPorte, Ind. The engine shop is being dismantled and the special equipment transferred to LaPorte. The space thus vacated will be devoted to the herringbone gear department of the Falk works and new drill and tool equipment will be installed to double or triple the gear output. The shop will be equipped so as to turn out a herringbone gear as large as 16 ft. diameter and 6 ft. face.

Operations at the crane works of the Pawling & Harnischfeger Company, Milwaukee, were suspended for a day and a half last week because of damage resulting from a tornado, the second which swept the western section of Milwaukee County in 30 days. A huge boiler house chimney was destroyed and several furnace stacks were blown down.

The Simmons Mfg. Company, Kenosha, Wis., has broken ground for additions which will cost in the neighborhood of $100,000. The contractors are rushing work under a bonus clause requiring it to be completed in 45 days. The company is the largest manufacturer of metal beds, springs, etc., in the world.

The Nordberg Mfg. Company, Milwaukee, is preparing to engage in the production of Diesel engines on a large scale, having just concluded a deal with the Usines Carels Frères, Ghent, Belgium, for the American patent rights. The Belgium house has been selling Diesel engines through its American representative, W. R. Haynie, 30 Church street, New York.

The Badger Metal & Hide Company, Milwaukee, has been organized by H. Coplin, L. S. Sohn and R. R. Feldman, attorney, to deal in scrap metal and other products. The capital stock is $10,000.

The Automatic Diner Machine Company, Milwaukee, manufacturing slot machines for eating places, is negotiating with the business men's club of Grand Rapids, Wis., with a view to moving its plant to that city. It is planned to merge the plant with that of the Kaudy Mfg. Company, if the desired bonus can be raised.

The Key Calk Horseshoe Company, DePere, Wis., will spend about $15,000 in additional factory equipment. John W. Bodilly is president.

The Automatic Trip Carrier Company, Rice Lake, Wis., which recently suffered the loss of its plant by fire, has decided to remain in Rice Lake and has increased its capital stock from $50,000 to $100,000 and will immediately build a new plant for the production of stable and barnyard equipment.

E. A. Conrad, West Salem, Wis., is planning to establish a small factory for the production of an automatic stop device for use on carrier rails in factories, barns, etc.

The Badger Pulp & Paper Bag Company, Wausau, Wis., has awarded the general contract for a $125,000 addition, 132 x 146 ft., two stories, for the production of paper bags, etc., to L. A. DeGuere, Grand Rapids, Wis., architect and engineer. It will be of steel, concrete and tile construction.

The Milwaukee Locomotive Mfg. Company, Milwaukee, manufacturer of industrial locomotives, has increased its capital stock from $50,000 to $250,000. It is completing important additions and extending its operations.

The American Metal Products Company, Milwaukee, organized several weeks ago to manufacture bronze die castings, has started operations in a part of the foundry of the bankrupt Wambold Mfg. Company on Lisbon avenue. Additional space will be leased as the business demands.

The new plant of the A. F. Wagner Architectural Iron Works, Milwaukee, will be equipped with a 5-ton crane, individual electrically driven machinery, air hoists and electrical and air tools.

Detroit

DEDROIT, MICH., June 29, 1914.

June has been merely an average month in local machinery circles. Business was spotty and the total sales did not reach a large volume. The past week has been unsatisfactory; sales have been scattered and confined to single tools generally for replacement purposes. Some business in wood-working machinery is reported from Grand Rapids, due to the activity in the furniture industry. There is some demand for the smaller units in electrical equipment but no large installations are noted. Reports from jobbing foundries and machine shops indicate that the quiet conditions now prevalent are expected to continue the coming month. The volume of new construction work seems to be about normal.

The building occupied by A. Krolik & Co. and the Kurtz Paper Box Company, Detroit, was damaged to the extent of $75,000 June 23. Krolik & Co. manufacture overalls.

The Pneumatic Spring & Lock Company, Detroit, has been incorporated with $15,000 capital stock to manufacture a line of metal specialties. The incorporators are E. S. Bryant, George R. Cowles and Otto F. Beur.

The Pontiac Drop Forge Company, Pontiac, Mich., has been incorporated with $60,000 capital stock to manufacture drop forgings. Donald C. McCord, Detroit, is one of the principal stockholders.

The Lewis Spring & Axle Company, Jackson, Mich., has increased its capital stock from $350,000 to $750,000.

The Reo Motor Car Company, Lansing, Mich., has three new buildings under construction which will greatly increase the capacity of its plant. The additions will consist of a forge shop and power house, 96 x 225 ft.; a machine shop, 95 x 560 ft., both one story, and a three-story erecting and painting shop, 144 x 256 ft. Machinery of the latest type will be installed.

The business of the Mt. Clemens Casket Company, Mt. Clemens, Mich., has been acquired by F. A. Black, Milford, Mich. It is stated that the purchaser will considerably enlarge the capacity of the plant.

The E. C. Clark Motor Company, Jackson, Mich., has increased its capital stock from $15,000 to $265,000.

The Safety Elevator Stop Company, Kalamazoo, Mich., has been incorporated with $50,000 capital stock to manufacture a patent elevator stop. The new company has acquired a factory building.

The Grand Rapids Refrigerator Company, Grand Rapids, Mich., is enlarging its plant by the erection of three new buildings. These comprise a one-story addition to the enameling plant, 58 x 138 ft.; a four-story addition to the main plant, 30 x 100 ft., and a new four-story warehouse, 32 x 98 ft. The company manufactures cabinets and refrigerators. C. H. Leonard is president.

Indianapolis

INDIANAPOLIS, IND., June 29, 1914.

The Century Electric Company, of this city, has increased its capital stock from $6000 to $25,000.

The Rimolox Tire Carrier Company, Evansville, Ind., has been incorporated with $20,000 capital stock to manufacture tire holders or supports. The directors are M. A. Strouse, A. Harnishfeger and W. N. Erskine.

The J W. Davis Company, Davenport, Iowa, has let the contract for a large greenhouse to be erected at Terre Haute, Ind., at a cost of $100,000. The buildings will cover 11 acres and will require 500,000 sq. ft. of glass. Ten boilers will be used, developing 1500 hp.

The Vulcan Plow Company, Evansville, Ind., has distributed $6000, the annual profit sharing of the 125 employes. The average received was $48. It is the company's eighth distribution.

The Southern Sweatpad Company, Evansville, Ind., has started a new factory building to cost $20,000.

The Shelbyville Mirror Screen Company, Shelbyville, Ind., is erecting a new factory building to cost $12,000. The plants at Ford City, Pa., and Crystal City, Mo., will be moved to Shelbyville. Frank J. Rembusch is president and manager of the company.

The Vincennes Knotter Company, Vincennes, Ind., has been incorporated with $100,000 capital stock to make baling presses. The directors are Charles Unger, Charles O. Alton and Henry M. Williams.

Goodland, Ind., will install a waterworks plant to cost about $20,000. The engineers are considering whether to have a direct pressure or gravity system.

The Majestic Furnace & Foundry Company, Huntington, Ind., will devote entirely to its sheet metal department the increased capacity it is providing. It will not require additional machinery at present.

The Hayden Mfg. Company, Ft. Wayne, has been incorporated with a $10,000 capital stock to manufacture gearless differential mechanisms for motor vehicles. The directors are R. C. Diserens, Van B. Perrine and W. H. Scheiman.

Cleveland

CLEVELAND, OHIO, June 29, 1914.

The machine tool trade continues very dull with very few orders coming out except for single tools, and the demand for these is exceedingly light. The only inquiry of any size pending is that of the Auto Products Company, Canton. This company's list of about 30 machines was noted some time ago and it is expected that the business will be placed during the coming week. The improvement recently noted in punching and shearing machinery is holding up and a local builder reports a fair volume of single tool orders during June. Conditions in the foundry trade are generally unchanged, although a few foundries are getting a slightly better volume of business.

The city of Cleveland, through its commissioner of purchases and supplies, will receive bids July 8 for a mechanical self-cleaning screen and on July 9 for sheet-steel piling in connection with the erection of the new filtration plant. Bids for stop cock boxes for the water department will be received July 9. Bids for heating equipment for the New Woodland avenue bath house will be received July 21.

The National Paving Brick Company has taken over the plants of the Harris Brick Company and the South Zanesville Sewer Pipe & Brick Company, Zanesville, Ohio, and will increase the output by the erection of new kilns and the installation of new machinery.

The plant of the W. J. Clark Company, Salem, Ohio, was almost completely destroyed by fire recently. It is stated that steps will be taken to rebuild the plant as soon as possible.

A large plant for the manufacture of an extended line of cement products is being erected by O. C. Barber at Barberton, Ohio. A complete machine shop will be provided in connection with the plant.

Norwalk, Ohio, has voted at a special election to issue $120,000 in bonds to erect a municipal electric lighting plant.

The Miller Rubber Company, Akron, Ohio, will shortly begin factory extensions. Plans for new buildings are now being prepared.

The Acme Fence & Iron Company, Cleveland, Ohio, builder of iron and wire work, whose incorporation was recently mentioned, has elected the following officers: William Hamermaster, president and general manager; J. W. Dirkson, vice-president; W. A. Dreher, secretary; C. W. Hamermaster, treasurer, and A. M. Diederick, director.

The U. S. Smoke Eliminator Company, Cleveland, has been incorporated with a capital stock of $10,000 by S. E. Hufford, W. H. Downs, and others, to manufacture smoke eliminators.

The James Mfg. Company, Canton, Ohio, has been incorporated with a capitalization of $100,000, by C. H. James, C. J. James, and others, to manufacture plumbing supplies. The company will succeed the Buckeye Tank & Seat Company.

Cincinnati

CINCINNATI, OHIO, June 29, 1914.

Several local machine-tool makers are preparing to close down their plants for the usual midsummer repairs. Ordinarily, one week is sufficient for this purpose, but with business as dull as it is now a few expect to be idle the entire month of July. Both domestic and foreign trade are very quiet, and there are few inquiries for any kind of tools. Probably a little more interest is taken in small-sized lathes than in other machines. Business with the dealers is slack both in new and rebuilt tools.

One encouraging feature in the situation is the increased demand for wood-working machinery of all kinds. Most of this business is coming from the West, although orders from the South are also increasing. Small electrical equipment continues encouraging. There is no change in the situation with the jobbing foundries, and if any large number of machine-tool builders close their plants for an extended period, the local melt of iron will naturally fall off.

The J. A. Fay & Egan Company, Cincinnati, officially denies that it intends moving its plant to another city, as the press reports have intimated. The company has a large site at Bond Hill, a Cincinnati suburb, on which it will erect a factory as soon as car service can be arranged. Nothing will probably be done on the project this year.

The Cincinnati Ice Company, Cincinnati, is having plans prepared for a large plant to be erected on Price Hill. It also contemplates enlarging one of its present plants at Wade and Plum streets.

The Suburban Bell Telephone Company, Cincinnati, is having plans prepared by Harry Hake, architect, Provident Bank Building, for a large garage to be erected on Burnet avenue. A small repair shop will be provided.

The Good Samaritan Hospital, Cincinnati, has let contract for a power house to be built at Clifton and Dixmyth avenues.

A 150-hp. boiler will be installed in a new plant to be built by the Evanston Baking Company, 3561 Montgomery road, Cincinnati.

The Union Distilling Company, Carthage, Ohio, a Cincinnati suburb, has had plans prepared for a new boiler plant that will be 57 x 60 ft., and of brick construction. Two 300-hp. boilers will be installed in the building when completed, equipped with automatic stokers, etc.

The City Engineering Company, Dayton, Ohio, has been incorporated with $25,000 capital stock, by H. G. Noble, and others. The company will make a specialty of small metal and wood-working tools. Quarters have been secured in the Beaver Power Building.

The city of Dayton, Ohio, will soon call for bids for a new pumping station, for which plans have been prepared.

The city of Columbus, Ohio, is re-advertising for bids on the auto-truck repair shop of which mention was recently made. The bids submitted exceeded the appropriation allowed.

It is reported, but not confirmed, that the St. Mary's Machine Company, St. Mary's, Ohio, intends to move its plant to St. Charles, Mo., some time in the present year.

The village of Frankfort, Ohio, is advertising for bids on a waterworks plant. George H. Schadel, clerk, will open the bids July 21.

The wood-working and blacksmith departments of the Talbert Brothers Company, West Elkton, Ohio, recently destroyed by fire, will probably be rebuilt at an early date. The company manufactures buggies and light wagons.

The Scott-Johnston Mfg. Company, Dayton, Ohio, is a new incorporation with $10,000 capital stock to manufacture and deal in foundry supplies. W. M. Scott and William Johnston are the principal incorporators.

Birmingham

BIRMINGHAM, ALA., June 29, 1914.

Outside of the agricultural demand, wholesale hardware men report a continuation of depression with spurts of inquiries that do not always materialize. Gasoline engines and second-hand boilers have been in frequent demand and structural lines call for a respectable amount of supplies. There is nothing in the sawmill business and mines are buying very little. The approaching holidays will intensify the prevailing stagnation. Merchants believe things will be better as soon as the crops begin to move.

The Cunningham & Lloyd Lumber Company will probably rebuild their sawmill and planing mill plant burned at Tuscaloosa, Ala., a few days ago with a loss of $25,000.

The Cincinnati Southern and the Alabama Great Southern have bought a tract of land at Chattanooga for the purpose of extending yard facilities and, it is reported, erecting additional shops.

The Farmers Cotton Oil & Fertilizer Company, Madison, Ala., will build a gin.

Bay Minette, Ala., votes July 27 on an issue of bonds to construct an electric lighting system. Edgar B. Kay, Tuscaloosa, Ala., is engineer.

The city of Jackson, Ala., is arranging for the establishment of waterworks and an electric lighting system.

The Sycamore Cotton Mills, Sycamore, Ala., will improve its steam power plant by the installation of a new engine, etc.

The Georgia Clay Products Company, Athens, Ga., has been incorporated with a capital stock of $140,000 by W. L. Childs and others. It will improve and operate the plant of the Georgia Brick Company.

The Macon Terminal Company, Macon, Ga., has been incorporated with a capital stock of $100,000. It will build the union passenger station of the Central of Georgia, the Southern and the Georgia Southern and Florida railroads. I. A. Winburn, president of the Central of Georgia, will direct the work of improvement.

The White Hickory Wagon Mfg. Company, Atlanta, Ga., contemplates doubling the capacity of its plant.

The Southern Wheel Company, St. Louis, has plans for a new factory building and equipment in Atlanta, Ga., for the manufacture of standard and other carwheels. The Park A. Dallis Company, Atlanta, is the engineer.

The Augusta Spring Bed Company, Augusta, Ga., has been organized by W. E. Robinson, J. E. Fowler and others for the purpose of manufacturing spring beds, cots, mattresses, etc.

The Bond Lumber Company, Glenwood, Fla., will rebuild the mill recently burned. The new plant is to have a daily capacity of 25,000 ft.

P. F. McDevitt, Pinellas Park, Fla., heads an organization which proposes to establish at St. Petersburg, Fla., an extensive plant for the manufacture of syrup. The proposed daily capacity is 60 tons.

D. H. Marbury, Marbury, Ala., and others, have incorporated the Marbury Oil Company with a capital stock of $25,000 and propose to build a cotton-seed oil mill, etc.

The Central South

LOUISVILLE, KY., June 29, 1914.

A satisfactory volume of machinery business has been in evidence of late, but the tendency on the part of a number of concerns to cut prices has prevented it from really benefiting the trade as much as had been hoped. Instances have been quoted recently of business going to bidders at 25 per cent. under the quotations of the next lowest, indicating that very little profit could possibly have been left in the prices. This condition applies particularly, it is stated, to boilers and electrical equipment. However, the fact that trade is showing more life, in spite of terrifically hot weather which has put a crimp in most ordinary activities, is encouraging. Crop reports from certain parts of the cotton country are less favorable, a severe drouth having affected some sections.

The biggest machinery order of the year in this territory was that of the American Oak Leather Company, which let a contract to the Allis-Chalmers Mfg. Company for the installation of the equipment needed in the electrification of its Louisville plant. The amount involved is about $20,000. Three generators, two of them 250 kw. and the other 100 kw., and about 500 hp. in motors were provided for. The company had been figuring on second-hand machinery, but finally decided to buy new. Alternating current equipment was specified. The business attracted much competition. The Allis-Chalmers Company also got a good order from the Louisville & Nashville Railroad Company recently for the

installation of a number of motor-driven direct connected machine tools for installation in the Louisville shops.

The Federal Chemical Company, Louisville, whose local plant, known as the Globe Fertilizer Company, was recently burned, has begun to buy new equipment for the plant which is being erected to take its place. The James Clark, Jr., Electric Company received an order for three 35, one 10 and one 3 hp. motor. Special equipment, including mixers, and additional electrical equipment will be bought later.

The T. W. Bayer Company, Twenty-fifth and Main streets, Louisville, has been organized with $7000 capital stock and will manufacture locomotive paints. The company is now operating a small plant, which will be enlarged in the near future.

The tannery of George Moser & Co., New Albany, Ind., burned last week with $50,000 loss, will be rebuilt.

The steam bakery of Conrad Hertlein, New Albany, Ind., was burned recently with $10,000 loss. Much of the equipment will have to be replaced.

Hazel, Ky., is considering the establishment of an electric light plant. The mayor may be able to give details.

The Owensboro Ditcher & Grader Company, Owensboro, Ky., has been organized to manufacture contractors' equipment. W. A. Steele is the principal incorporator. Plans for a factory will be determined shortly.

The S. F. McCormick Lumber Company, Lexington, Ky., whose planing mill was recently burned with $50,000 loss, has decided to rebuild. Motors and wood-working machinery will be needed.

The McGlone Bros. Lumber Company, Morehead, Ky., has acquired a tract of timberland at Roxana, Ky., and will establish a sawmill with a capacity of 25,000 ft. a day.

The Irvine Ice Company, Richmond, Ky., has been incorporated with $3000 capital stock to establish an ice plant at Irvine, Ky. L. B. Weisenburgh and others are interested.

The factory of the S. E. Rice Tobacco Company, Greenville, Ky., was burned recently with $25,000 loss. The plant will be rebuilt, it is stated.

The Butler Creamery Company, Butler, Ky., is being organized and will need refrigerating and other equipment.

The Donaldson Sign Company, Newport, Ky., has acquired a site in Covington, Ky., and will erect a factory. Metal-working and other equipment will be needed. B. Wisenall is architect for the building.

John W. Watts, Paducah, Ky., who is having a ventilating sash lock made by contract with the Crescent Tool Company, Cincinnati, Ohio, may equip his own factory.

St. Louis

ST. LOUIS, Mo., June 29, 1914.

An interesting feature of the conditions affecting the machine-tool market the past few days has been the increasing number of reports of new enterprises under contemplation or actually put in course of legal formation. While the new developments have not actually reached the dealers in the shape of inquiries for tools and lists of equipment, they have increased the optimism felt in the St. Louis market, inspiring confidence that there will be better business soon. It is taken as evidence that there is a freer feeling in moneyed circles and that the banks' indisposition to aid new enterprises and expansion is loosening up a bit. The crop reports from the St. Louis territory, too, are such as to lead only to cheerfulness. In the matter of actual business, dealers report a continuance of the slowly improving condition, and while there have been no large lists put out there has been a gratifying evidence of better feeling and an increase in the transactions put in positive form. Second hand tools are being sought to some extent, but not out of line with the demand for new machinery. Collections are reported satisfactory, with practically no disposition among purchasers to seek extended time.

The sand elevator of the Union Sand & Material Company, St. Louis, at Drake, Mo., was destroyed by fire June 26, with a loss on equipment of about $25,000. It will be replaced.

The American Macaroni Company, St. Louis, has leased a four-story factory building and will equip it with machinery for its food product business.

The entire plant of the Luyties Pharmacy Company, St. Louis, manufacturer of specialty products, was destroyed by fire June 22 with a loss of $150,000. The plant will be re-equipped.

The Excelsior Tool & Machine Company, East St. Louis, Ill., has begun construction work on its recently announced addition and will soon seek the necessary equipment.

The Carter Carburetor Company, St. Louis, of which Charles O. Baxter is president, has bought a new factory building and will install equipment for the manufacture of carburetors, and also erect and equip a brass foundry on adjoining vacant land.

The Laclede Automobile & Supply Company, St. Louis, has been incorporated with a capital stock of $50,000 by C. S. Clickener, L. J. Curtin, J. J. Miltenberger and Harold Johnson and will equip a garage and repair shop.

The Down Town Mines Company, St. Louis, of which C. J. Walker is president, will install about $50,000 of pumping machinery in property controlled by the company in Leadville, Colo.

The water commissioner of St. Louis, E. E. Wall, has asked the municipal assembly for the sum of $750,000 for the installation of additional pumping capacity in the city water plant.

The Western Development Company, St. Louis, controlling about 20 public service plants in and near Leadville, Colo., will install about $200,000 of equipment in a central plant, and discontinue its individual plants so far as possible. All the new power equipment will be electric.

The Mallinckrodt Chemical Company, St. Louis, will at once replace that portion of its plant which was recently destroyed by fire with a loss of $220,000.

The Moloney Electric Company, St. Louis, will make a number of changes in its plant in the direction of increase of capacity, including the installation of cranes and other special equipment.

The Midland Bookbinding Company, Kansas City, Mo., has been incorporated with a capital stock of $15,000 by Charles F. How, Albert C. Combs and William H. Augustus to equip a bindery plant.

The Beall Mfg. Company, Kansas City, Mo., has been incorporated with a capital stock of $50,000 by B. P. Beall, Edgar L. Evans and J. H. Borders to engage in manufacturing.

The Standard Motor & Mfg. Company, Kansas City, Mo., has been incorporated with a capital stock of $10,000 by H. T. Folsom, J. E. Harvey and J. B. Renshaw and will equip a small plant.

The Little River Drainage District, of which William A. O'Brien, Cape Girardeau, Mo., is chief engineer, will drain about 500,000 acres and will probably require a plant of about 32 dipper dredges with eight drag-line machines all ranging up to about 4½ yd. capacity.

The city of Palmyra, Mo., will expend about $26,000 on electric light and water plant under plans prepared by F. D. Martin, Rialto Building, Kansas City, Mo.

H. A. Dalby will equip an electric light plant at Hopkins, Mo., having been granted a franchise by the city.

The Caruthersville Sand & Supply Company, Caruthersville, Mo., has been incorporated with a capital stock of $13,000 by Samuel Haye, J. A. Riggs and J. W. Carmean and will install a sand recovering plant.

The Westport Laundry Company, Kansas City, Mo., recently incorporated with a capital stock of $25,000, will equip a steam plant at once. J. M. Harper is president.

The city of Kirksville, Mo., has voted a bond issue of $25,000 for the increase of its waterworks plant.

The Farmers' Gin Company, Morrillton, Ark., has been organized and will equip at once. N. B. Skipper will be manager.

The Taylor Gin Company, Taylor, Ark., has been incorporated by local capitalists.

The city of Fort Smith, Ark., will build a municipal electric light plant and the mayor has ordered plans drawn by the city engineer.

The Northwest Steel & Iron Works, Little Rock, Ark., has been incorporated with a capital stock of $25,000 by E. R. Hamilton, Henry McDonnell and others and will engage in steel and iron fabrication, etc.

The city of Devol, Okla., of which W. T. Huff is city clerk, has plans for the installation of an electric light plant.

The city of McCloud, Okla., will install an electric lighting system and has engaged the Benham Engineering Company, Oklahoma City, to prepare the plans and specifications.

The Alex Mill & Elevator Company, Alex, Okla., has been incorporated with a capital stock of $16,000 by J. H. Pruitt of Lindsley, George Caldwell and N. F. Caldwell and a plant will be equipped.

The city of Eufaula, Okla., of which J. P. Ransom is city clerk, will complete its waterworks and will also install sewage disposal equipment.

The Mobile & Ohio Railroad Company plans to build shops in the Clamore yards near Jackson, Tenn. B. A. Wood, chief engineer, Mobile, Ala., is in charge.

The city of Memphis, Tenn., will equip a new pumping station with induction motors, single phase transformers, 4

double-suction horizontal and 2 vertical centrifugal pumps, a 20-ton motor hoist, traveling crane, two vertical shaft pit pumps, two motor-driven rotary vacuum pumps and other apparatus. J. H. Weatherford, Courthouse, Memphis, is engineer in charge.

The Hardwood Top Company, Morristown, Tenn., has been incorporated with a capital stock of $25,000 to manufacture solid hardwood table tops. Bids for the necessary machinery will be received by Daugherty Brothers, Russellville, Tenn.

The board of commissioners of Nashville, Tenn., will install an electric pumping unit, the plans and specifications being in the hands of the water tax assessor.

The Charles Anderson Company, Cookeville, Tenn., is reported in the market for equipment for a water system with motor-driven turbine pumps.

The Kentucky-Henderson Coal Company, Henderson, Ky., has been incorporated with a capital stock of $425,000 by J. A. Curtis, L. C. Mizer and W. H. Hill, all of Schofield building, Cleveland, Ohio, and will announce equipment details later.

The Danville Light, Power & Traction Company, Danville, Ky., has increased its capital stock from $50,000 to $100,000 for the purpose of adding new equipment.

Walter S. Harkins, Prestonburg, Ky., has plans for the immediate equipment of a waterworks plant for the city.

Texas

AUSTIN, TEXAS, June 27, 1914.

As a result of the decided improvement in the condition of the cotton crop, the demand for cotton ginning and compress machinery shows a considerable increase. Plans for the construction of several cotton-seed oil mills that were deferred a few weeks ago on account of the poor crop prospects that then existed have been revived.

The Farmers' Mill & Gin Company, Victoria, will construct a cotton gin. F. B. Lander is interested.

The Farmers' Gin Company, which has just been organized at McKinley, with a capital stock of $10,000, will establish a cotton gin. J. E. White is interested.

The Malone Gin Company will construct a cotton gin at Bowie. C. R. Morgan is interested.

The Texas Refining Company of Greenville has purchased a site at San Antonio for a cotton-seed oil mill that it will construct at a cost of $125,000. In connection with this mill the company will erect a plant for the manufacture of cotton-seed oil compounds. Frank J. Phillips is president.

The City Council of Nixon has granted a franchise to A. W. Norton & Son for the construction of a waterworks plant and distributing system.

The Farmers' Gin Company will build a cotton gin at Blue Ridge. J. D. Wilson is head of the company.

The Corpus Christi Ice Company will construct an ice factory at Corpus Christi. S. A. Preston is interested.

The Modern Concrete Company, San Antonio, will build a plant for the manufacture of concrete building material.

The Texas Power & Light Company has begun the construction of an electric light and power plant at Gainesville that will cost about $50,000. The company will erect similar plants at Denison and two or three other places in northern Texas, it is stated.

The Farmers' Gin Company will construct a cotton gin at Paris to replace the one which was destroyed by fire last year.

The Freeport Sulphur Company has begun extensive additions and improvements to its sulphur mining plant and refinery at Freeport. The total cost of the proposed work will be $250,000, the contract for which has been awarded to Westinghouse, Church, Kerr & Co., New York. The power station will be used to pump the liquid sulphur to the surface and also to pump oil from the storage tanks to the mines, a distance of four miles.

The Egan Mill Company has purchased a site at Dallas for a mill which it will construct to manufacture mixed feed for live stock. Besides the mill an elevator will be erected of 75,000 bu. capacity. The initial cost of the buildings and machinery will be more than $50,000.

E. J. Peterson is constructing an electric light and power plant at Tularoso, New Mexico.

The Tempe Cotton Growers' Exchange has awarded the contract to W. K. Bowen, of Mesa, Ariz., for the construction of a cotton compress and a ginning plant at Tempe, Ariz. It will be the first compress to be erected in the Salt River Valley.

The Pacific Northwest

SEATTLE, WASH., June 23, 1914.

Seattle is feeling the general depression, although authorities assert that the city is in better condition than any other in the Northwest. A large amount of building is under way or in contemplation, due to the low price of lumber and oversupply of labor. The mills and logging camps are operating, but owners maintain they are running on a very narrow margin of profit. Threatened strikes have not materialized, and in all likelihood will be averted. A general shut-down of mills and logging camps will occur for several days around July 4, and arrangements are being made for a great deal of overhauling and repair work, giving quite an impetus to this class of equipment

Machinery dealers report a fair demand for milling and mining machinery, also for power equipment for irrigation plants and numerous canneries throughout Oregon and Washington. The machine-tool business consists mainly, as usual, of small single-tool orders, and shows hardly as much life as was expected, though some slight improvement has taken place. Dealers in wood-working machinery report a fair volume, with some evidence of a better feeling in the lumber trade. The miscellaneous demand in the interior is well maintained, and still greater activity is expected as the grain harvest advances. Considerable growth is expected in the fall in the country garage and small-shop trade.

Fire, which originated from crossed electric wires, recently destroyed the Norman L. Upper shingle mill, located at West Garfield street and Joliet avenue, Seattle. The loss is estimated at between $12,000 and $15,000. It is understood the plant will be rebuilt.

The Raymond Concrete Pile Company, Portland, Ore., has purchased a site on which it will erect a plant for the manufacture of concrete piles.

C. A. & J. C. Butler, of Seattle, Wash., have purchased a site in Mays, Wash., on which they will at once start the erection of a shingle mill, to have a daily capacity of 90,000 shingles.

A. K. McAlpine, Stites, Idaho, plans the construction of a band mill, having a capacity of 40,000 ft. daily. A planing mill will be built a little later.

The lumber yard, blacksmith shop and machine shop of the Filion Mill & Lumber Company, Port Angeles, Wash., were destroyed by fire.

The Pacific Towboat Company, Seattle, is taking figures for the construction of a 70-ft. tug, to be powered with a Diesel engine.

The Loggers' & Contractors' Machinery Company, Portland, has taken new quarters for its Seattle branch office at 105 White Building.

The Western Cooperage Company, with headquarters in Portland, has made arrangements to move its large stave mill from Aberdeen, Wash., to St. John's, Ore.

The Enterprise Brass Foundry, Seattle, has moved its plant from 92 Virginia street to a new concrete building at Seventh avenue south and Lander street.

The North Bend Lumber Company, North Bend, Ore., has ordered a logging engine, said to be the largest of its type ever brought to Coos Bay.

The Stetson-Ross Machine Works, Seattle, has acquired a site on the corner of Hanford and First avenue south on which it will erect a large machine shop. It is expected that work will start next month.

A. E. White, and associates, Olympia, Wash., have organized the Modern Mill Company, which will take over the properties of the Black Mill Company and rebuild the lumber mill recently burned.

Meacham & Babcock, Seattle, have secured the contract for supplying and installing the machinery for operating gates in the Lake Washington Canal, now in course of construction in Seattle. Their contract price was $110,652.70.

The Snoqualmie Falls Lumber Company, Seattle, has been formed with a capitalization of $3,000,000, by the Grandin Coast Lumber Company and Weyerhaeuser timber interests. The company will handle large tracts of timber in the Snoqualmie district, and work on the construction of a $1,000,000 sawmill with a capacity of 500,000 ft. daily, will be started at once. Among those interested are George D. Long, Tacoma; O. D. Fisher, Fisher Mills, Seattle, and W. D. McCormick, Seattle. The plant will be electrically driven.

The city of Ridgefield, Wash., has granted to J. H. Cunningham, Portland, franchises for an electric lighting system and a water system. Construction on both plants will be started at once, as only 12 months have been allowed for the completion of the waterworks and 8 months for the electric light plant.

The City Council, Victor, Idaho, is considering the installation of a municipally owned light and power plant.

The city of Clyde Park, Mont., has commissioned C. H. Green & Co., Spokane, Wash., to prepare plans, surveys, estimates of cost, etc., for a proposed municipal waterworks system.

The city of Pullman, Wash., has sold a bond issue of $20,000 and will use the proceeds in extensions and improvements of the waterworks.

The Robinson Lumber Mfg. Company, Everett, Wash., states that the recent fire at its plant was in the yard and tramway and not in any building. No machinery was destroyed.

Eastern Canada

TORONTO, ONT., June 29, 1914.

The Canadian Crucible Steel Company, which is capitalized at $500,000, has decided to locate at London, Ont.

A new cement company will erect a plant at St. Mary's, Ont., in the near future with a capacity of 1200 barrels per day. F. G. Sanderson, of St. Mary's, is interested in the company.

It is announced that a large cream separator plant will be erected at Sarnia, Ont. C. L. Anker-Holt, president Anker-Holt Company, of Port Huron, is interested in the company.

The Ontario Concrete Post Company, Ltd., will erect a factory at Brantford, Ont., to manufacture fence posts and electric poles and to do other reinforced work. The company is capitalized at $40,000. J. W. Clark, Cainsville, Ont., is president; John O. Whiting, Onondaga, Ont., is secretary-treasurer. The head office of the company is in Muncey, Ill.

At a shareholders' meeting of the London Street Railway Company, London, Ont., the issuing of bonds to the extent of $750,000 for extensions, improvements and rolling stock was ratified.

The Canadian Alkali Company, Sandwich, Ont., announces that it will spend $500,000 in enlarging its plant.

The growth of the Ford Motor Company of Canada, Ltd., is illustrated by the number of new branches being established. It is erecting a large plant on Christie street, Toronto, a site for a plant is being excavated at Montreal, and now comes the announcement that property has been purchased at London, Ont., for a new assembling plant.

The America-La France Fire Engine Company of Canada, Ltd., Toronto, has been incorporated with a capital stock of $50,000 to manufacture fire engines and other fire apparatus.

The Excelsior Electric Mfg. Company, Ltd., Toronto, has been incorporated with a capital stock of $40,000 by L. T. Ruthledge, N. H. Manning, W. E. Corman, and others, to manufacture electrical machinery.

The Canadian Novelty & Supply Company, Ltd., Waterloo, Ont., has been incorporated with a capital stock of $60,000 by James Patrick, David Earl, A. H. Millar, and others, to manufacture moldings, electric light fixtures, etc.

The Chaleurs Bay Pulp & Paper Company, Ltd., Sherbrooke, Que., has been incorporated with a capital stock of $100,000 by Harry R. Fraser, Arthur F. Fraser, and others

La Compagnie Industrielle d'Alfred, Ltd., Alfred, Ont., has been incorporated with a capital stock of $100,000 by Joseph A. Bourbeau, of Montreal; Honore Belanger, and others, of Alfred, Ont., to operate saw mills.

The Interstate Electric Novelty Company of Canada, Ltd., Toronto, has been incorporated with a capital stock of $40,000 by John A. Kent, E. W. Wright, Alfred Wolff, and others.

The Galt Wire & Ornamental Iron Company, Ltd., Galt, Ont., has been incorporated with a capital stock of $40,000 by John Spalding, Robert J. Spalding, and others.

Western Canada

WINNIPEG, MAN., June 26, 1914.

Machinery houses report a fair increase in demand for repair parts for factories and mills. Large contracts are not numerous, however, and the volume of business, while probably nearly as large as at the corresponding date last year, is considerably smaller than two years ago. Almost every day an announcement is made regarding some contemplated new industrial plant, but the actual work on most of such seems to be rather slow in starting. This is no doubt owing to the general tightness of money for investment in industrial expansion. Leading financial houses continue to report a slow movement of capital from Europe to Western Canada, and some are predicting that there will not be much betterment in this respect before the beginning of next year. The good crop outlook, though, is having some beneficial effect on the situation.

A company in which A. E. Thomas, Winnipeg, is one of the principals, is seeking to establish a broom factory in Regina, Sask. The original cost of the plant is placed at $10,000.

The City Council of Regina, Sask., has made an agreement with A. Harrison, Minneapolis, whereby the latter will establish a $50,000 ice plant at Regina. Building operations will begin shortly.

The Regina, Sask., board of trade announces that the Premier Glass Company, Ltd., St. Pierre aux Liens, Quebec, will start soon to build a factory at Regina, and that later the company will establish plants at a couple of other important points in the Dominion.

The Ogilvie Flour Mills Company, Ltd., Winnipeg, intends to build a grain elevator at Wilson Siding, near Lethbridge, Alberta, and three elevators on the Suffield branch of the Canadian Pacific Railway in the same province.

The Barclay Shingle Mills, Ltd., Vancouver, B. C., has been incorporated with a capital stock of $25,000.

The Sprague Lumber Company, Ltd., Winnipeg, Man., has been incorporated with a capital stock of $2,000,000 by H. C. H. Sprague, J. D. Sicclair, D. B. Sprague, and others.

The ratepayers of Leduc, Alberta, have passed a by-law to grant $15,000 for the installation of electric light.

Richmond, B. C., will spend $40,000 in making extensions to its waterworks plant.

The Town Council of Oxbow, Sask., is contemplating the erection of an electric light plant for the town to cost $17,000.

The Alberta Lumber Company's plant at Vancouver, B. C., was destroyed by fire. The loss will amount to $90,000. A large amount of machinery was damaged.

The Dunlop Pulp & Paper Mills, Ltd., Selkirk, Man., has been incorporated with a capital stock of $1,000,000 by F. A. Dunlop, T. McHattie, and others.

Moose Jaw, Sask., is contemplating improvements to the municipal electric light plant. The improvements include the installation of 1000-hp. boilers, a water softening plant, eight 100-lb. dump automatic coal scales, complete new piping for 3500-hp. steam plant, etc.

The International Light Company, Ltd., has entered into an agreement with Regina, Sask., to establish a factory in that city. The company is capitalized at $150,000. This company is the Canadian section of the International Light, Novelty & Specialty Company of Chicago.

Government Purchases

WASHINGTON, D. C., June 29, 1914.

Bids were received by the Bureau of Supplies and Accounts, Navy Department, Washington, June 23, for supplies for the navy yards, as follows:

Schedule 6813, Construction and Repair

Class 11, Mare Island—One combination saw and dado machine, with equipment—Bid 2, $487.89; 105, $564.04; 150, $522, $583, and $544; 181, $587.25; 210, $505.95; 392, $600 and $400.

Alternate—Same, f.o.b. works—Bid 2, $436.05; 105, $522.85; 150, $429; 181, $522.75; 210, $463.95; 392, $517.50 and $317.50.

Schedule 6843, Construction and Repair

Class 101, Puget Sound—Three bridge cranes—Bid 57, $14,000; 94, $14,336; 230, $16,300 and $15,130; 261, $12,900; 367, $13,885.

Alternate—Same, f.o.b. works—Bid 57, $12,130; 94, $10,700; 208, $15,920; 210, $10,541; 230, $11,595 and $10,220; 261, $11,050; 367, $12,070.

Schedule 6849, Construction and Repair and Steam Engineering

Class 161, Norfolk—One self-contained grinding machine—Bid 38, $3260; 113, $4003 and $3728; 181, $2100; 210, $2435 and $2420; 256, $2912; 258, $1850.

The names of the bidders and the numbers under which they are designated in the above list are as follows:

2, American Woodworking Machinery Company; 38, Brown & Sharpe Mfg. Company; 57, Cleveland Crane & Engineering Company; 94, Exeter Machine Works; 105, J. A. Fay & Egan Company; 113, Walter H. Foster Company; 150, Harron, Rickard & McCone; 181, Kemp Machinery Company; 210, Manning, Maxwell & Moore; 208, Morgan Engineering Company; 230, Niles-Bement-Pond Company; 256, Prentiss Tool & Supply Company; 258, J. W. Paxson Company; 261, Pawling & Harnischfeger Company; 367, Whiting Foundry Equipment Company; 392, F. A. Branda & Co.

Trade Publications

Emery Wheel Dresser.—Standard Tool Company, Cleveland, Ohio. Folder. Shows an emery wheel dresser for use in shops having a hardened tool steel cutter which is constructed so that the edges retain the same sharp angle until worn to the hub. A brief description of the dresser is given together with engravings of it and the cutter.

Hand Traveling Cranes.—Brown Hoisting Machinery Company, Cleveland, Ohio. Catalogue P. Pertains to a line of hand operated traveling cranes. One of the special features of the crane is the use of a single I-beam supported at each end on a patented cast-steel truck frame. There are two planed surfaces at the center of the truck frame upon which the I-beam rests, and by means of this construction, the crane can be easily and quickly erected even in close quarters. A number of views of the different parts of the crane supplement the description. Mention is also made of the different types of Brownhoist trolleys that can be supplied for the cranes.

Locomotive Repairs.—Goldschmidt Thermit Company, 90 West street, New York City. Second edition of pamphlet No. 21. Embodies instructions on the use of Thermit in railroad shops with a number of illustrations and diagrams of work that has been done in this way. In addition to the general instructions for the use of the process, specific directions are given for the welding of various parts. Brief mention is made of a gasolene compressed air preheater with directions for its use.

Gas Engines.—National Transit Company, Department of Machinery, Oil City, Pa. Catalogue. Lists the various features of a line of four-cycle horizontal tandem double-acting side-crank type gas engines which can be built in sizes from 300 to 700 hp. in single tandem units and from 600 to 1400 hp. in twin tandem units. A general description of the construction of this engine is given, the text being supplemented by a number of illustrations and tables and engineering data on the determination of the indicated horsepower and mean effective pressure, the gas required to produce 1 hp. for the various types of engines per hr. and the relative heat values of various fuels are included together with a partial list of users of this engine.

Riveting Hammers and Drilling Machines.—Ingersoll-Rand Company, 11 Broadway, New York City. Forms Nos. 4020 and 8011-1. The first is a 32-page catalogue on water feed drilling machines, which is an improved type of the one that has been on the market for some time. A brief account of the development of the drill is given, and mention is made of the several special features of construction. The description is supplemented by a number of engravings and drawings of the different parts, and there are a number of views of the drill at work. A table of sizes and capacities is included. The second bulletin presents a brief description of a rivet set retainer which has been developed for use with the company's riveting hammers, to meet the requirements of the safety enactments of the various States.

Turret Vertical Milling Machines.—Turner Machine Company, Danbury, Conn. Mailing card. Describes briefly a turret vertical drilling machine, in which four operations can be performed with one machine instead of having to pass the material from machine to machine or change the tools. In this machine four tools are mounted in the head and are brought into play by turning the controlling handle. An illustrated description of this machine appeared in *The Iron Age*, May 28, 1914.

Autogenous Welding.—Monarch Mfg. Company, Dayton, Ohio. Folder. Describes the Dayton welding and cutting apparatus, which can also be used for removing carbon deposits from cylinders of internal combustion engines. This apparatus is made as a combination decarbonizing and welding outfit or as a combination decarbonizing, welding and cutting outfit, or as a plain decarbonizing set. Views showing the different types in use are included, together with illustrations of repairs that have been made by the apparatus.

Disintegrating and Washing Screen.—American Concentrator Company, Springfield, Ohio. Pamphlet. Illustrations and descriptive matter explain the operation of the New Century disintegrating and washing screen, which revolves in a tank of water. It is designed and constructed so as to be an ore, sand or rock washer, grizzly or sizing screen, combined in one machine for the first treatment of materials in milling, dredging or washing operations, where a thorough disintegrating or washing effect is desired. Views of a gravel washing and crushing plant, in which the screen is used in conjunction with a bucket elevator and a crusher are included.

Forging Machines.—National Machinery Company, Tiffin, Ohio. Forging machine talk No. 3. Points out the advantages of having a large gather or distance of travel of the heading ram after the gripping dies close in a forging machine. A brief description of how this is obtained in the company's forging machines is given and a top view, showing the double cam gripping mechanism for securing it is included.

Boring Mills.—Gisholt Machine Company, Madison, Wis. Folder. Mentions briefly the advantages of machining locomotive driving boxes in a 42-in. boring mill, and shows a number of engravings of the operation being performed. In a shop where one of these mills was used in conjunction with a special driving box chucking device, the box was completely bored in 24 min., with a marked reduction in cost.

Ball Bearings.—Hess-Bright Mfg. Company, Philadelphia, Pa. Loose leaf circular. Illustrates and describes ball bearing mountings for the column of a jib crane. The precautions to be observed in installing the bearings are briefly touched upon.

Side Head Boring Mill.—Pratt & Whitney Company, Hartford, Conn. Illustrates a side head boring mill. After a brief general introduction and a set of condensed specifications, the details of the machine's construction are gone into at some length, the text being supplemented by a number of engravings of the various parts. One of the special features of the machine is a centralized control, and this is featured in a series of four engravings, showing how it is possible for the operator to manipulate various levers simultaneously. Mention is also made of the accessories that are furnished, such as tables, chucks, boring bars, turning tools, chuck jaws, etc.

Air Compressors and Vacuum Pumps.—Mesta Machine Company, Pittsburgh, Pa. Bulletin N. Describes and illustrates a line of air compressors and vacuum pumps that are equipped with a special type of plate valve, which was illustrated in *The Iron Age*, May 29, 1913. The advantages of these valves, which include greater efficiency, less wear and the elimination of lubrication and adjustment, are briefly mentioned. A diagram for determining the volumetric efficiency of the compressor from indicator cards is given, and a combined card from one of the compressors is reproduced.

Marine Boilers.—Murray Iron Works Company, Burlington, Iowa. Pamphlet. Contains a number of illustrations and a brief description of the construction of a line of Scotch marine internally-fired boilers with built-in water backs. The chief advantages claimed for this type of boiler are that they are self-contained, occupy a small amount of space and are capable of running for a long time without requiring cleaning or repairing. A table of dimensions and a brief specification are also included.

Channeling Machines.—Sullivan Machinery Company, 122 South Michigan avenue, Chicago, Ill. Bulletin No. 68-A. Shows the use of a channeling machine where rock excavation is to be done that requires a straight, smooth, solid wall. The special advantages claimed for this machine are economy in excavation, solidity and safety for adjacent structures. Brief descriptions of some of the work which these machines have done, such as the Chicago drainage canal, the wheel pits at Niagara Falls, and the Panama and New York barge canals, are illustrated and briefly described.

Vises and Tools.—Hollands Mfg. Company, Erie, Pa. Catalogue No. 22. Deals with a line of vises for use in toolrooms, machine shops, wood-working plants, foundries and plumbing shops. All of these are illustrated and briefly described, a single page being given to each special vise. Mention is also made of pipe cutters, reamers and taps. A price list of the various parts of the different vises is included.

Recording Differential Pressure Gauges.—Bristol Company, Waterbury, Conn. Bulletins Nos. 188 and 189. The first describes a line of recording differential pressure gauges and recording flow meters, equipped with helical type pressure tubes. The second gives a description of a patent float type of recording differential gauge, in which no springs are employed. This gauge is designed particularly for use in connection with orifices and pitot tubes for measuring and recording the rate of flow of natural gas. In both bulletins the descriptions are supplemented by views of various types of instruments and charts that are used.

Watchmen's Clock Systems.—Newman Clock Company, 178 Fulton street, New York City. Pamphlet. Covers a watch clock system which is a mechanical device and supersedes the electric type formerly used. In this system a portable watch is carried by the watchman to the various stations, and the key, when inserted in the clock, registers on the dial. Views of the clock and the keys used are given, together with the stations provided.

Wire and Nickel.—Hermann Boker & Co., 103 Duane street, New York City. Pamphlet. Relates to a line of nickel wire and sheets and resistance metal. Brief descriptions of these are given together with tables of their properties.